Recycled Water Committee

January 26, 2018

The Blueprint for One Water

Wendy Broley

Co-Principal Investigator

Brown AND Caldwell

Water Research Foundation®

Acknowledgements

Blueprint for One Water
WRF PROJECT 4660

Co-authors:

- Cindy Paulson, Principal Investigator
- Wendy Broley, Co-Principal Investigator
- Lynn Stephens, Co-Principal Investigator

Special thanks:

- Katie Henderson, Research Manager
- Project Advisory Committee
  - Serge Haddad, Los Angeles Department of Water and Power
  - Sarah Dominick, Denver Water
  - Vlada Kenniff, New York City Department of Environmental Protection
  - Katy Lackey, Water Environment & Reuse Foundation

Today's Outline

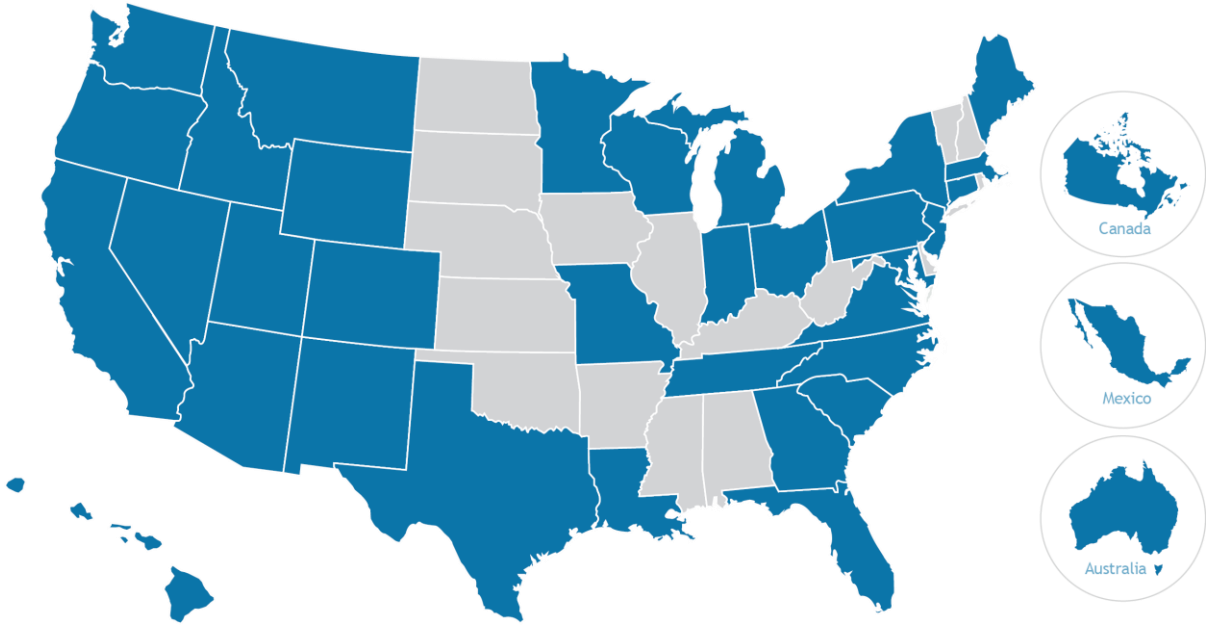
- What we mean by One Water?
- Driving forces for reliability/resiliency
- Blueprint phases, steps, and examples
  - Setting the Foundation
  - Establishing Direction
  - Engaging Stakeholders
  - Developing the Framework
  - Implementation and Feedback

> The One Water approach is gaining prominence for its ability to move communities toward reliable and resilient water systems, but many utilities have expressed the need for tactical steps or guidance to develop a One Water framework. Our goal with this blueprint is to give agencies the tools they need to get started, which we hope will lead to more widespread adoption and implementation.

Robert C. Renner, PE, BCEE
Chief Executive Officer | Water Research Foundation

Blueprint reflects input from Utilities and Water Professionals Worldwide

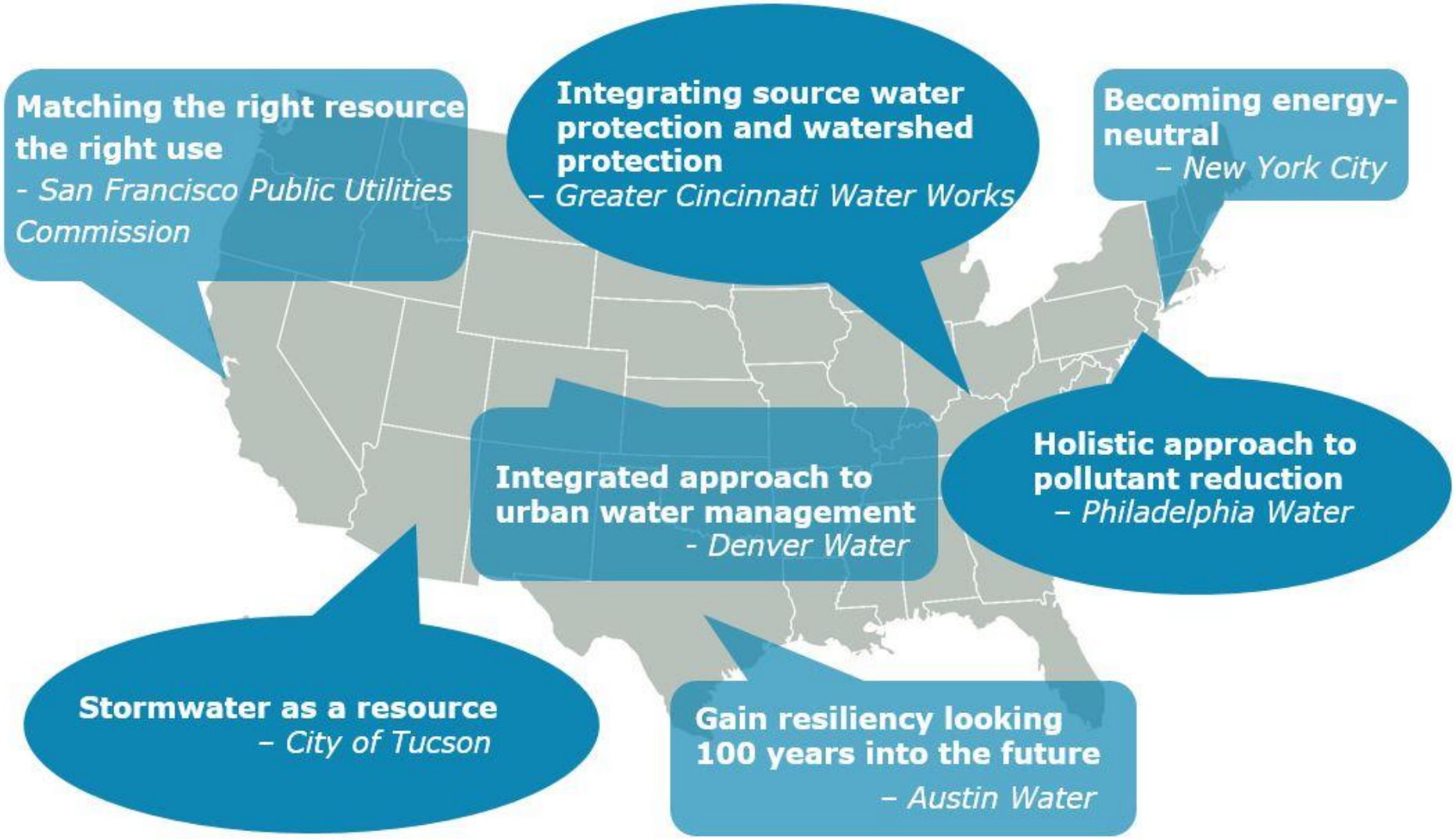
- International survey completed by more than 800 water professionals
- More than 10 one-on-one interviews
- 2-day workshop with more than 35 water professionals



One Water defined

One Water is an integrated planning and implementation approach to managing finite water resources for long-term resilience and reliability, meeting both community and ecosystem needs.

Definition of One Water is Site-specific

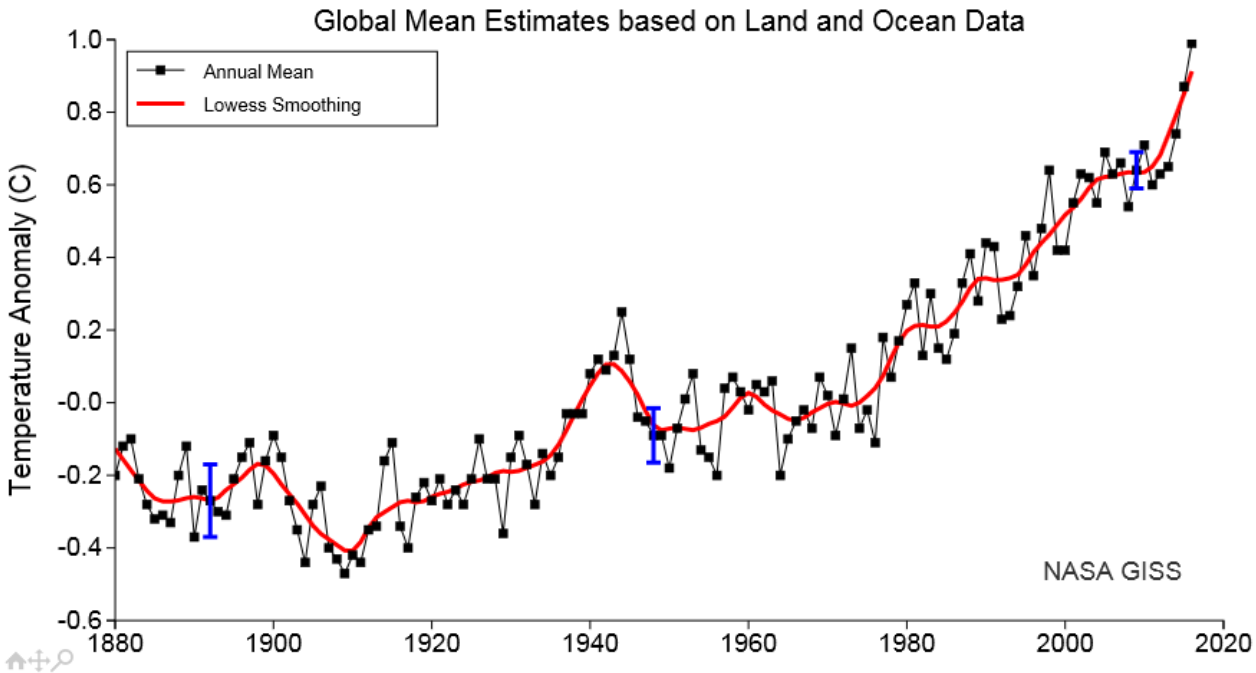


Driving Forces Toward One Water - Steadily Rising Temperatures

The Washington Post

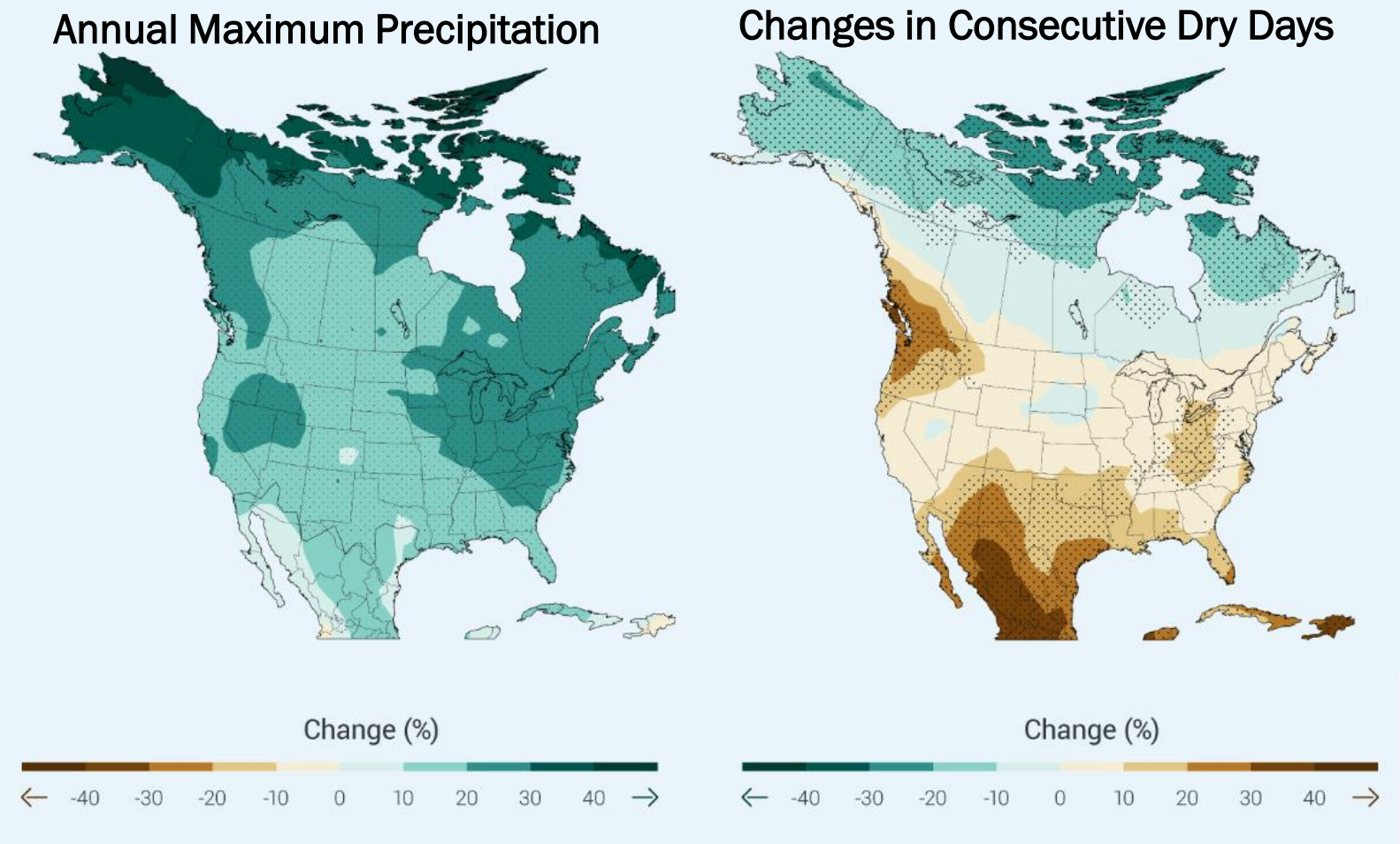
U.S. scientists officially declare 2016 the hottest year on record. That makes three in a row.

By Chris Mooney January 18 at 1:30 PM



Source: Hansen et al. 2010. Global surface temperature change. Rev. Geophys., 48. RG4004, doi:10.1029/2010RG0

Extreme Precipitation Events and Longer Droughts Expected



2070-2099 predictions

Source: NOAA NCDC/CICS-NC, 2014 National Climate Assessment

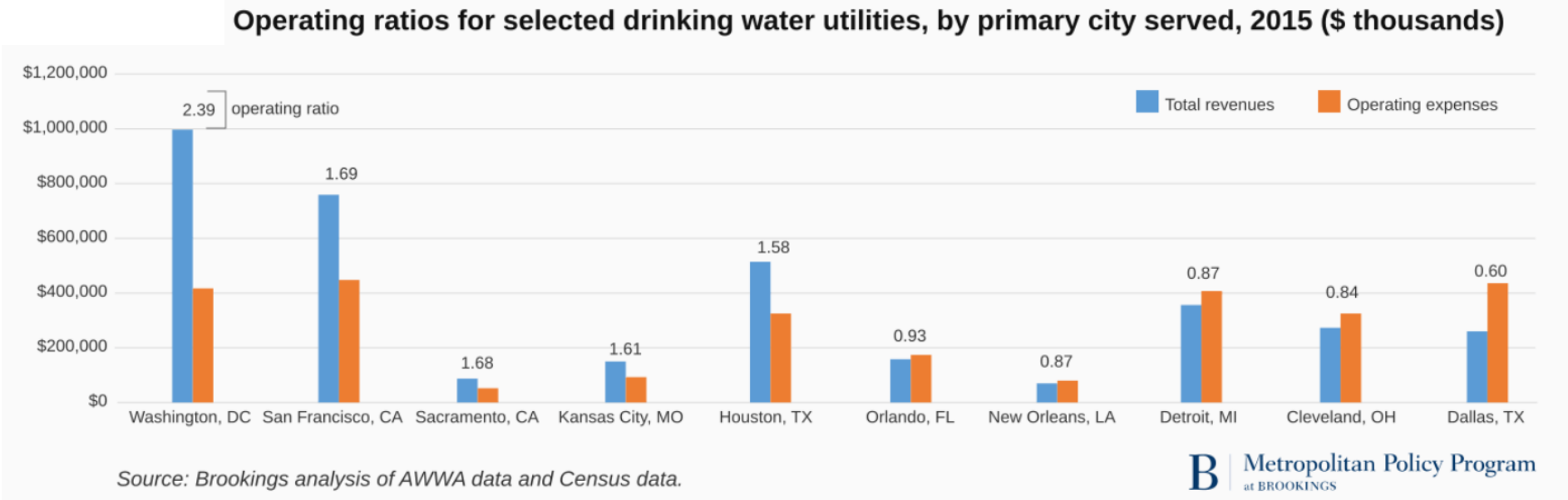
Unavoidable Aging Infrastructure Fixes

$84B Investment Needed in Next 20 Years

Source: ASCE Failure to Act Report, 2016

Source: Brown and Caldwell

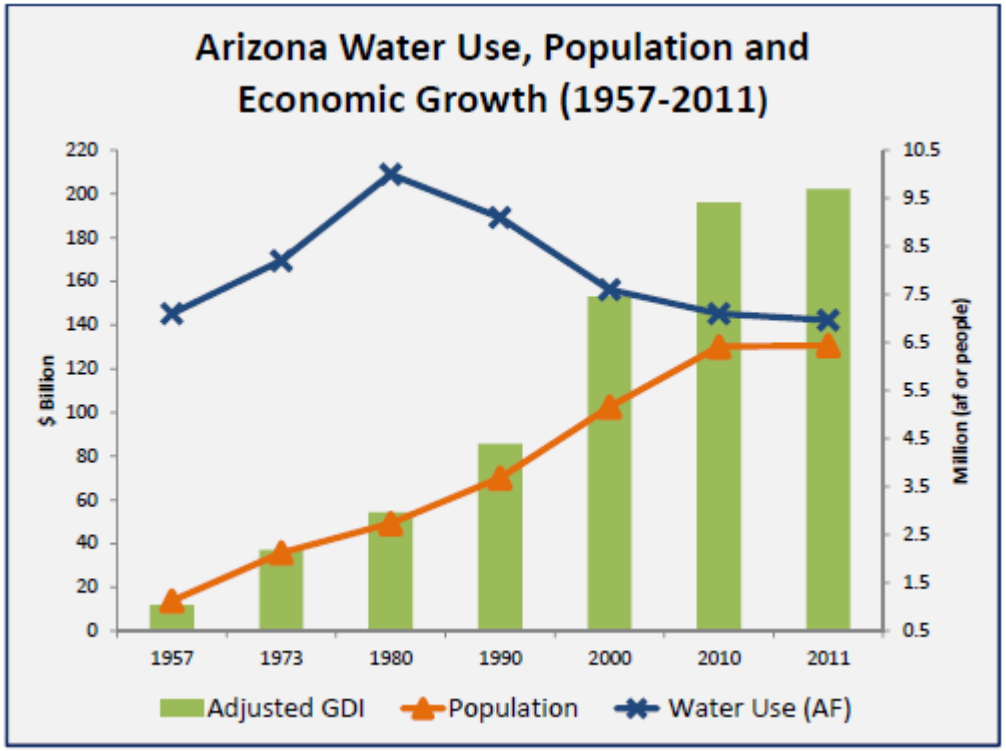
Challenges to Financial Sustainability



Source: Brooking's Institute, Dec. 2016

Arizona Drivers for One Water

- Population growth and new development
- Reliability of surface supplies are uncertain.
- Potential restrictions on CAP deliveries in the future
- Groundwater overdraft and declining groundwater quality
- Need for water supply diversification with potential for potable reuse through new reuse-related regulations



Arizona Department of Water Resources – Strategic Vision for Water Supply Sustainability

Others?

To Meet Current Challenges - One Water Shifts How We Manage Our Water Resources

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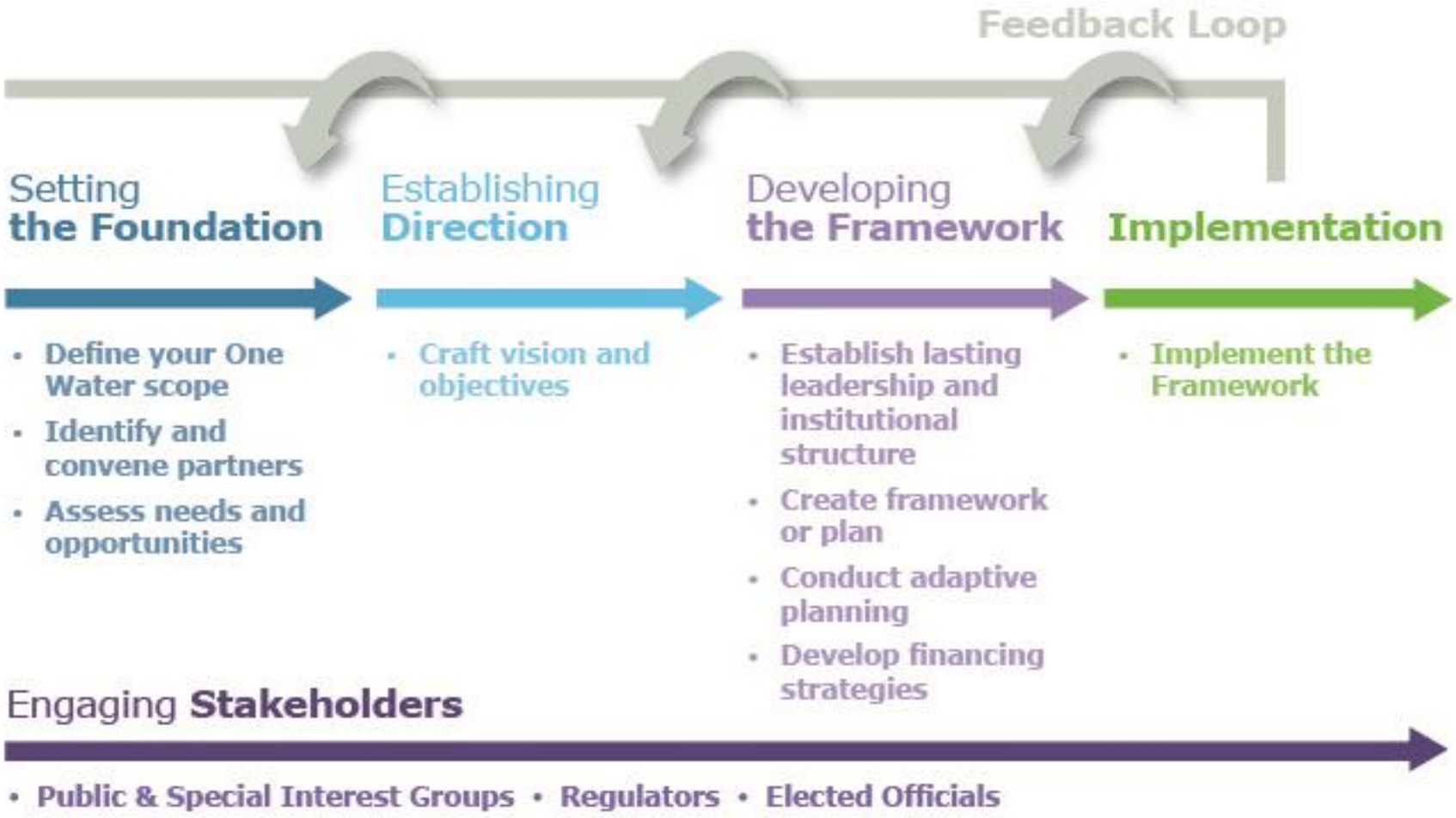
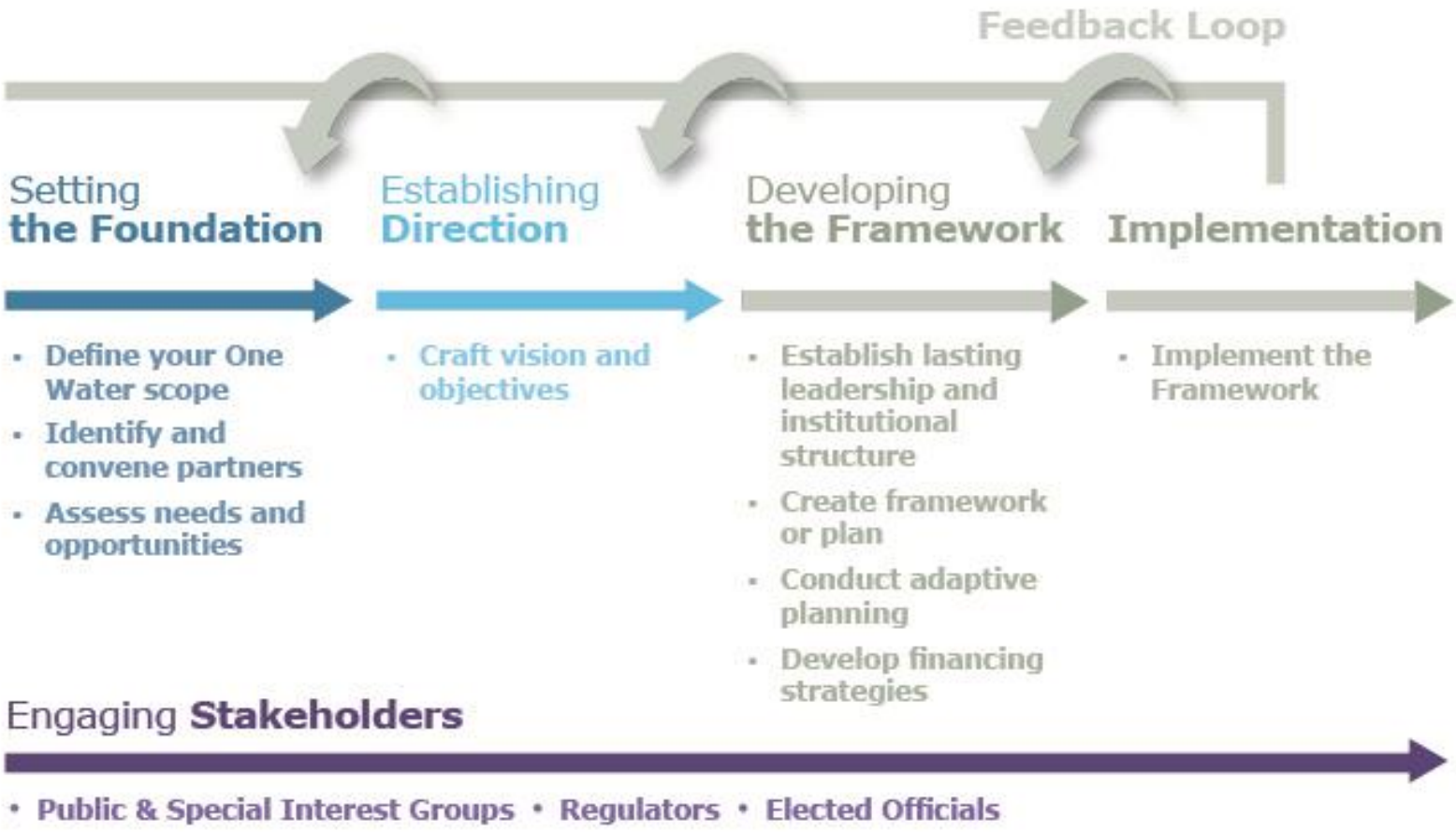
The Blueprint Provides Step-by-step Guidance



First, Getting Started on the Path to One Water



Each Blueprint Step Highlights Tangible Actions, Outcomes, Challenges

Define Your One Water Scope

One Water can look very different from one place to the next depending on your climate and geography, water resources, and environmental stressors. Developing a One Water framework begins with defining what One Water is or could be for your entity.

IMPORTANT ACTIONS

- ✓ Determine the challenges that your entity, community, and region are facing that may impact long-term water supply reliability, water resource resilience, or water quality needs.
- ✓ Reach out to other cities and utilities of similar size and with similar attributes that have implemented a One Water approach for insights to seed internal dialogue.
- ✓ Consider using a "re-imagining" exercise to explore how you might do things differently if you were creating your system from scratch.
- ✓ Consider what your organization is already doing or planning for to enhance sustainability and determine how best to leverage these existing activities.
- ✓ Decide what issues you want to address with an integrated One Water approach and what form it will take. Will this be a simple framework or a comprehensive plan?
- ✓ Begin to identify internal and external partners to include in the development of your One Water approach.

KEY OUTCOMES

- A rough definition of One Water for your entity including what will and won't be included

POTENTIAL CHALLENGES

- Identifying innovative approaches to water management
- Thinking big
- Defining a workable scale and scope

Identify and Convene Partners

- Focuses on identifying potential partners with similar interests that can help accomplish goals

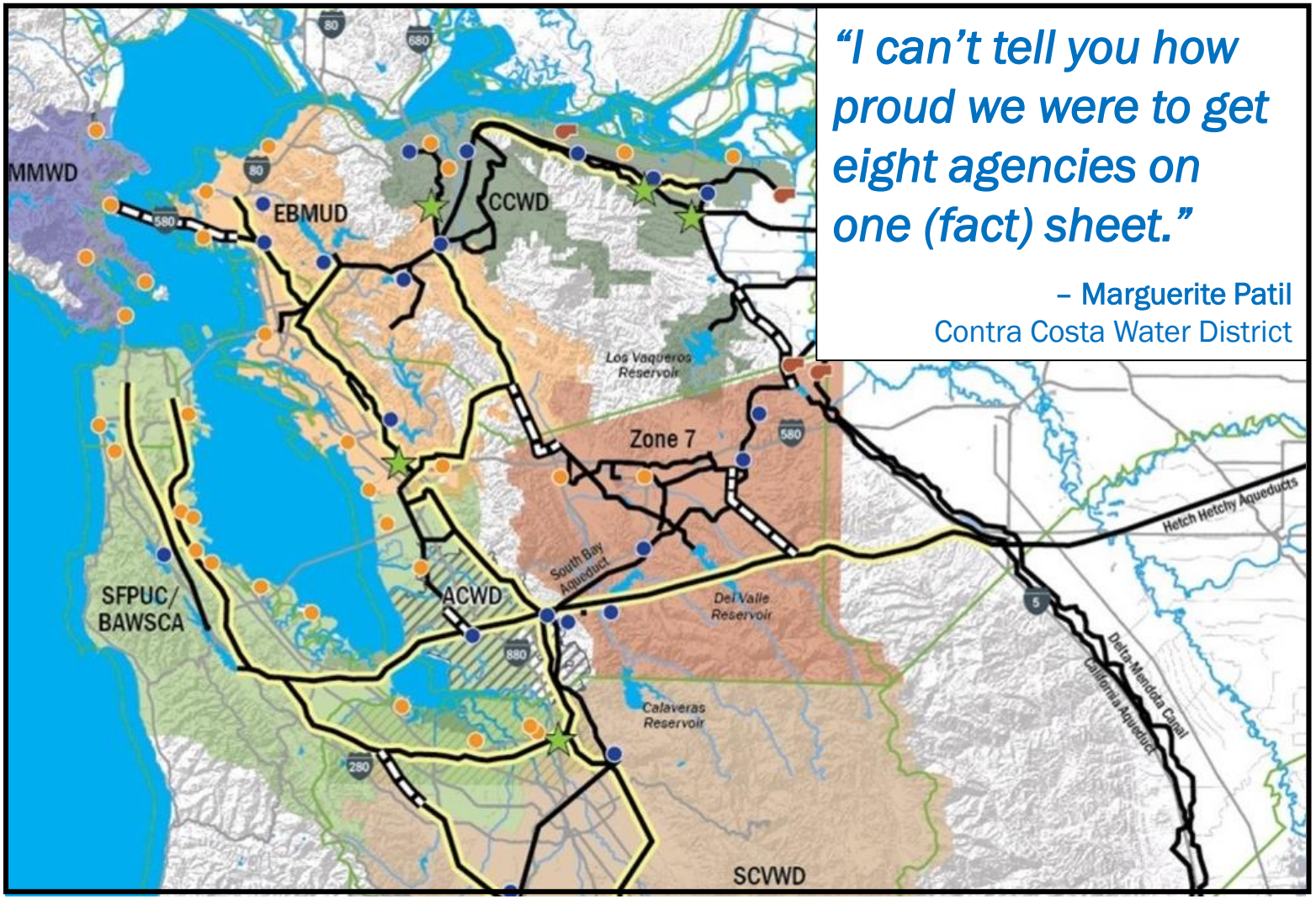
KEY OUTCOME	An agreement or statement of support to jointly pursue One Water

Assess Needs and Opportunities

- Evaluate opportunities for collaboration and integration

KEY OUTCOMES	Understanding of needs that will serve as the basis for goals and solutions List of potential opportunities and synergies between partners

Bay Area Regional Reliability Partnership Established Early Foundation for Success



"I can't tell you how proud we were to get eight agencies on one (fact) sheet."

– Marguerite Patil
Contra Costa Water District

Keys to BARR Success – Memorandum of Understanding

For more information:
Bay Area Integrated Regional Water Plan
http://tinyurl.com/BayAreaWaterPlan

Craft Vision and Objectives

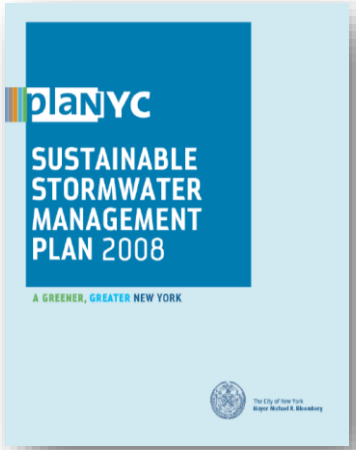
- Establishes an overarching vision and develops objectives

KEY OUTCOME

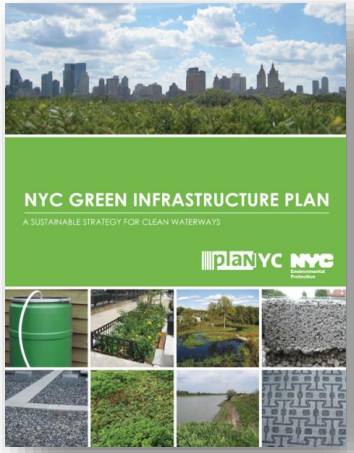
High-level document summarizing the vision and objectives for your framework

NYC DEP - One Water As a Unifying Framework for Multi-faceted Initiatives

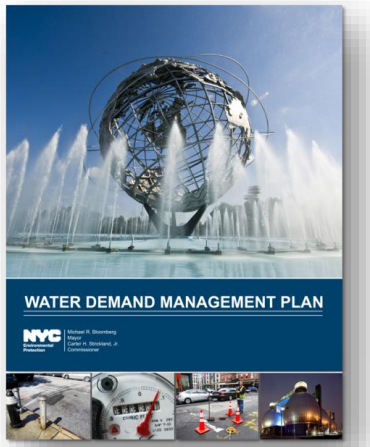
2007



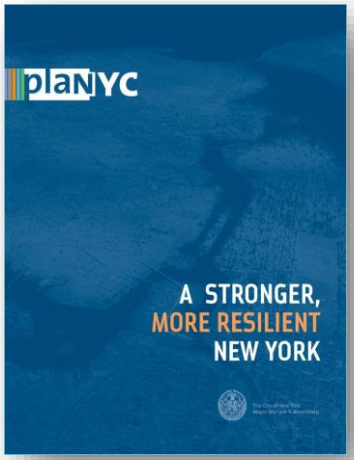
2008



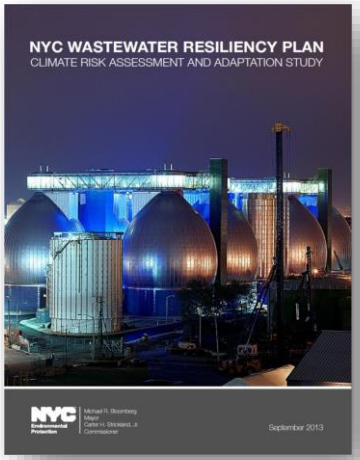
2010



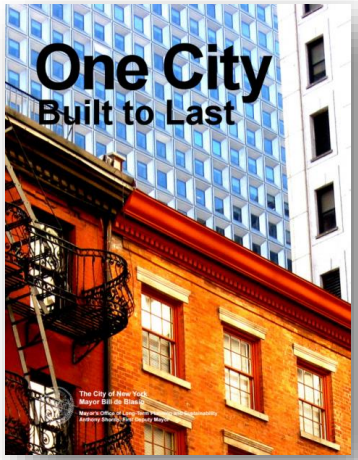
2013



2013



2013



2014

2015

New NYC Citywide Vision and Guiding Principles Sets Direction for Integrated Water Management

Guiding Principles:

- Integrate management of water resources and policies
- Cultivate climate resilience
- Contribute to a livable city
- Improve the health of local watersheds
- Provide flood protection
- Provide reliable, secure, and clean water supply
- Implement, monitor, and maintain a reliable and resilient wastewater system

Engage Stakeholders

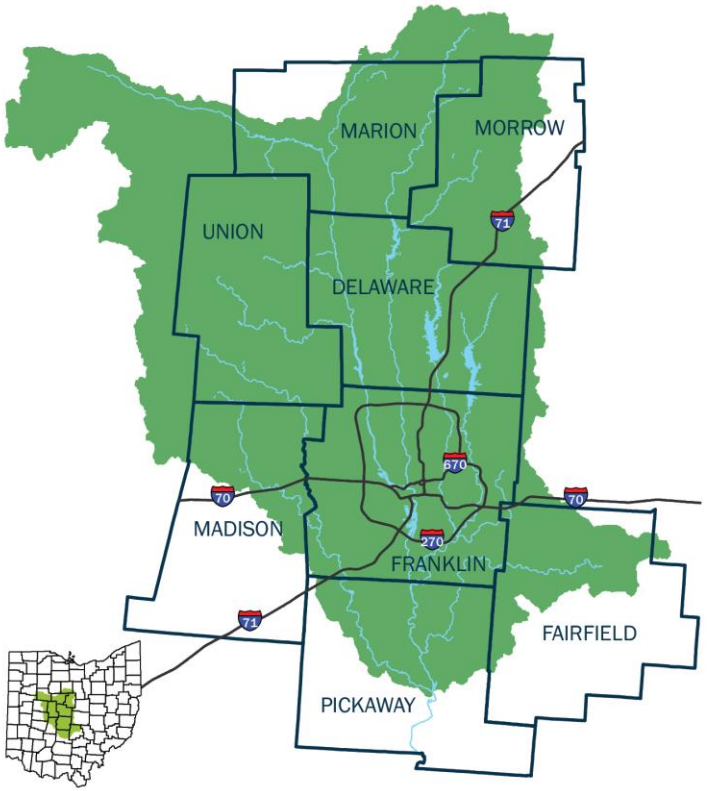
- Engagement needs to occur externally with elected officials, regulating bodies, special interest groups, technical advisors, and the community

KEY OUTCOMES

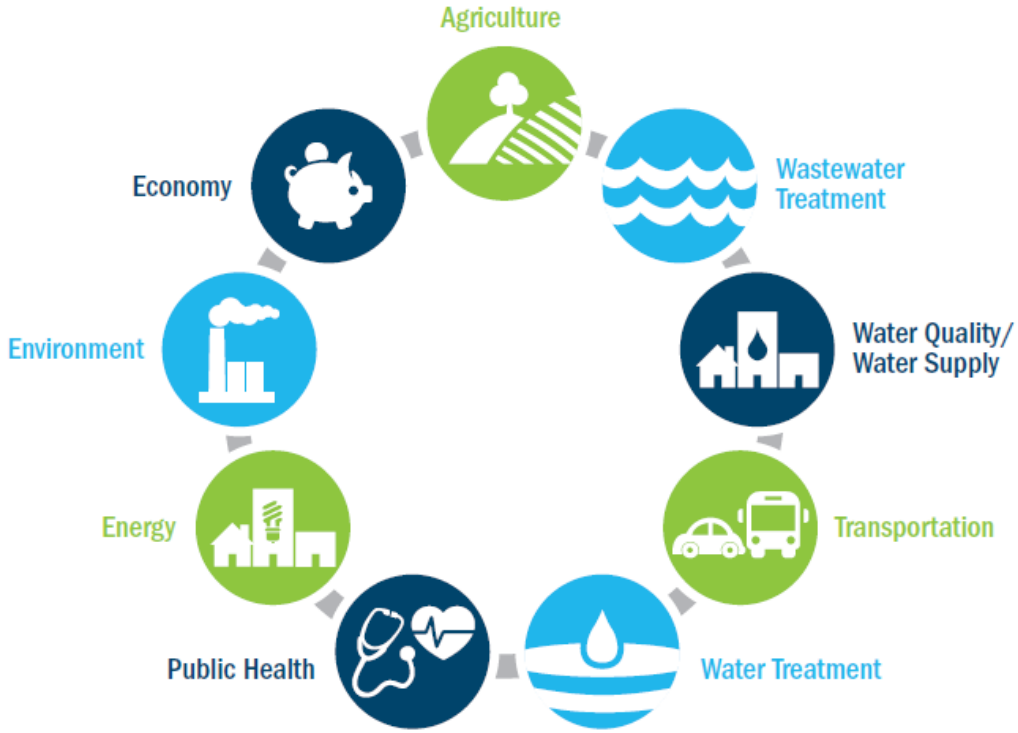
- Establishment of trust and working relationships
- Active interest and support for One Water approach

MORPC: Watershed-based Assessment of Climate Change Adaptation Across 6 Utilities

Scioto Watershed

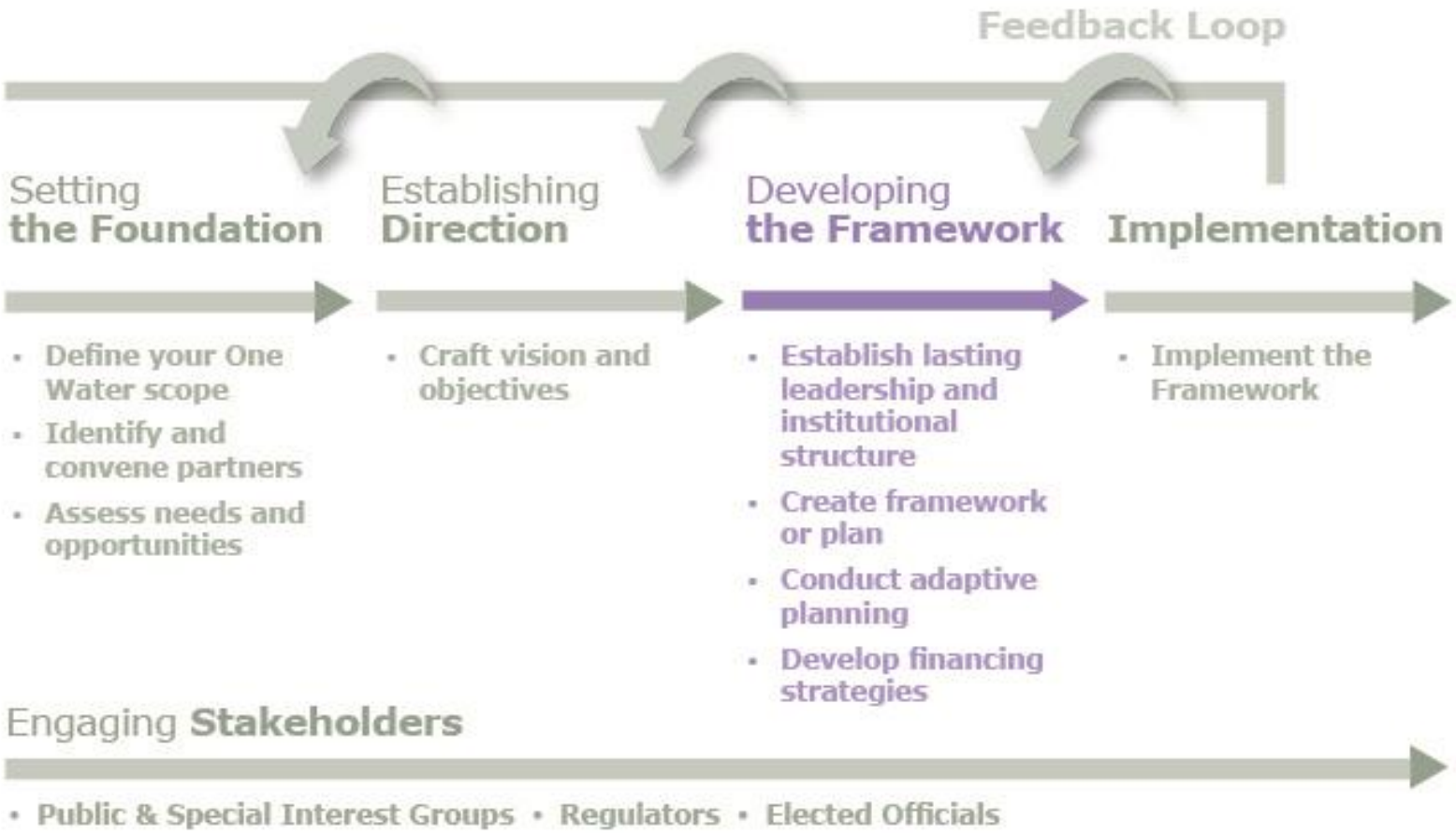


Risk Assessment Service Sectors

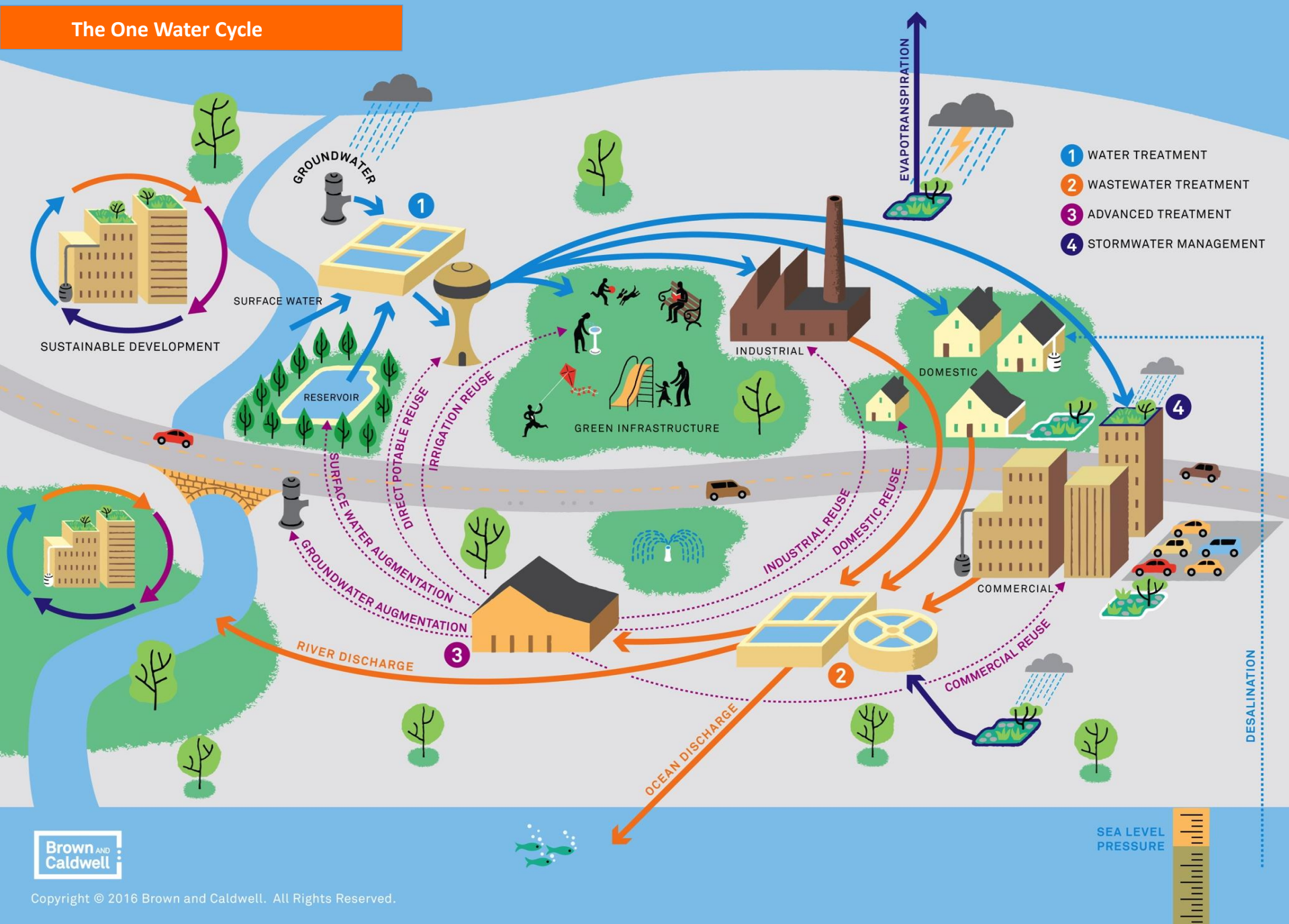


For more information:
http://tinyurl.com/SustainingScioto

Next, Developing the Framework, Plan, or Program



The One Water Cycle



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One Water Efforts Can Range From Simple Unifying Frameworks to Comprehensive Detailed Plans

Orange County, CA - Lasting Institutional Structure Enables Continuity and Momentum

OCWD and OCSD Partnership

- Guided by Joint GWRS Steering Committee
- Enables cost-sharing to design and construct the award winning Groundwater Replenishment System (GWRS).

ORANGE COUNTY WATER DISTRICT
SINCE 1933

ORANGE COUNTY SANITATION DISTRICT
PROTECTING THE ENVIRONMENT

For more information:
Orange County's Groundwater Replenishment System
http://www.ocwd.com/gwrs/

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PWD – Multi-faceted Financing Strategies prove effective for Implementation & Measurable Outcomes

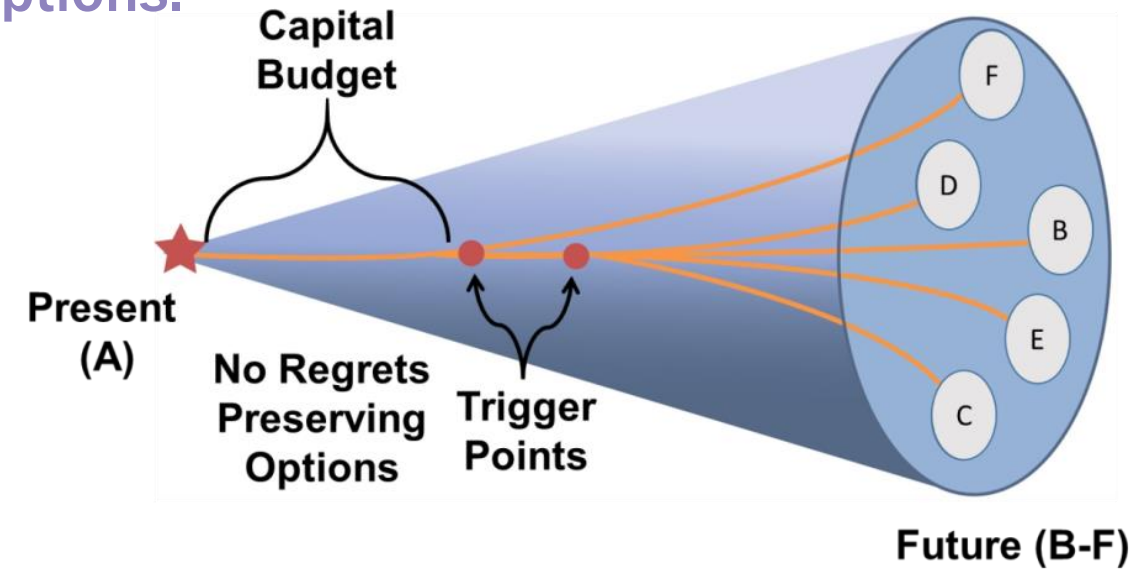
Philadelphia Water Department developed a 25-year plan (Green City, Clean Waters Program) to transform the landscape of Philadelphia's urban environment

- Multiple funding mechanisms
- Stormwater fee
- Stormwater credit for developers
- Grant program

For more information:
Green City, Clean Waters Program
http://tinyurl.com/PhillyWaterShed

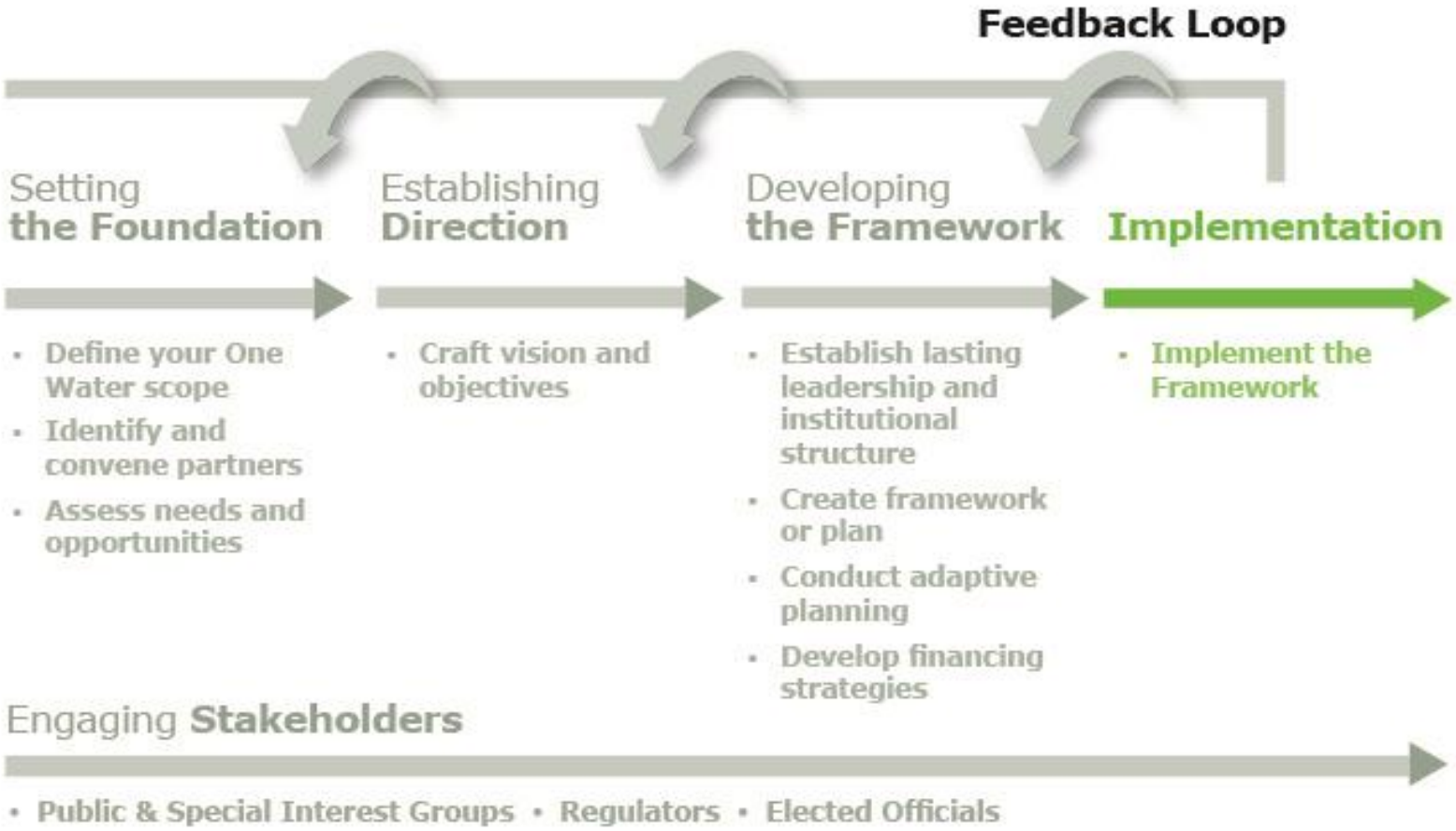
Denver Water - Adaptive Planning Provides Ongoing Relevance and Effectiveness, Despite Uncertainties

Denver Water's Integrated Resource Plan considers water-demand projections, demand-management alternatives, and water supply options to discover true deficiencies and viable future options.



For more information:
Denver Water's Climate Change Program
http://tinyurl.com/DWClimateChange

Finally, Implementation – Iterative Process
Take Early Action, Start Small, Build on Successes

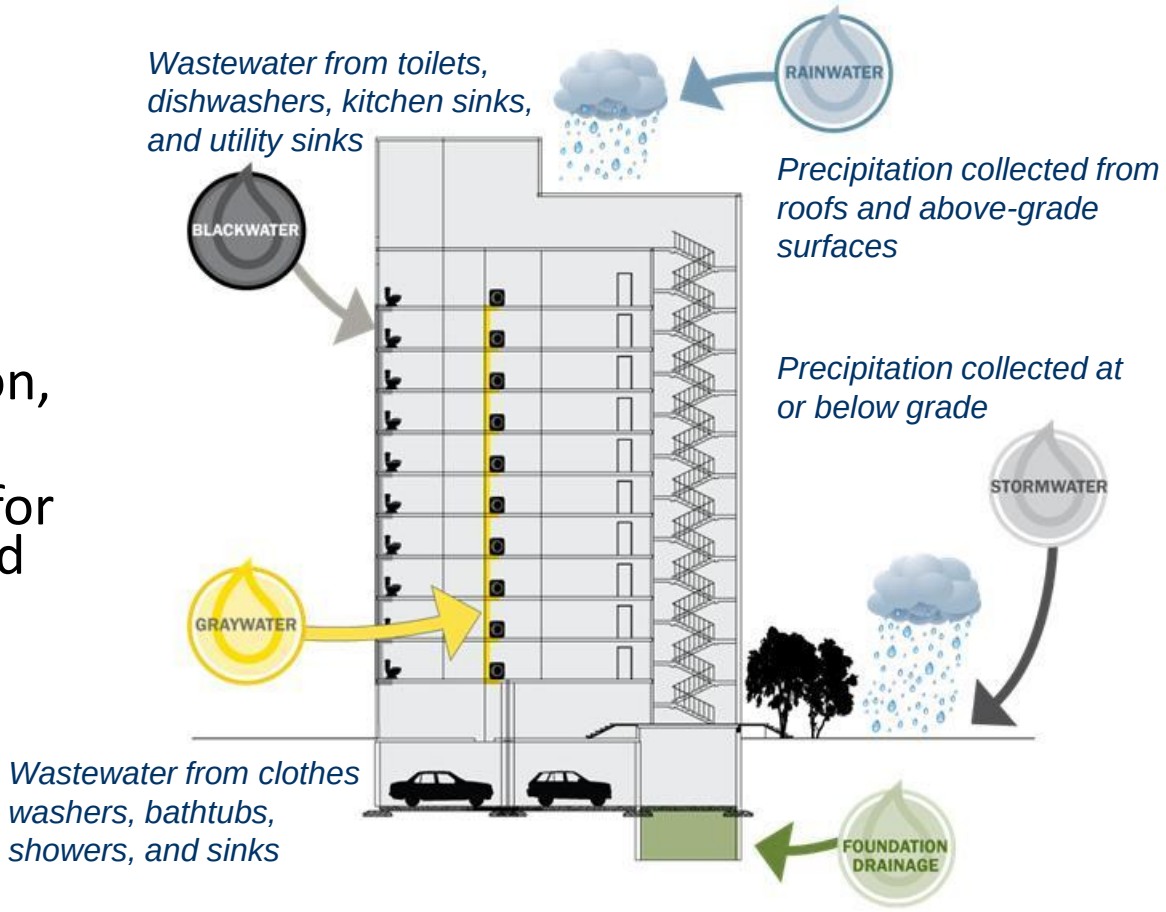


SFPUC - OneWaterSF as Means to Fulfill Vision for a Reliable and Resilient Future

- Implementation Roadmap to prioritize activities
- New opportunities for projects and programs
- Recommendations for research and development
- Partnerships for research or project implementation
- Policy needs

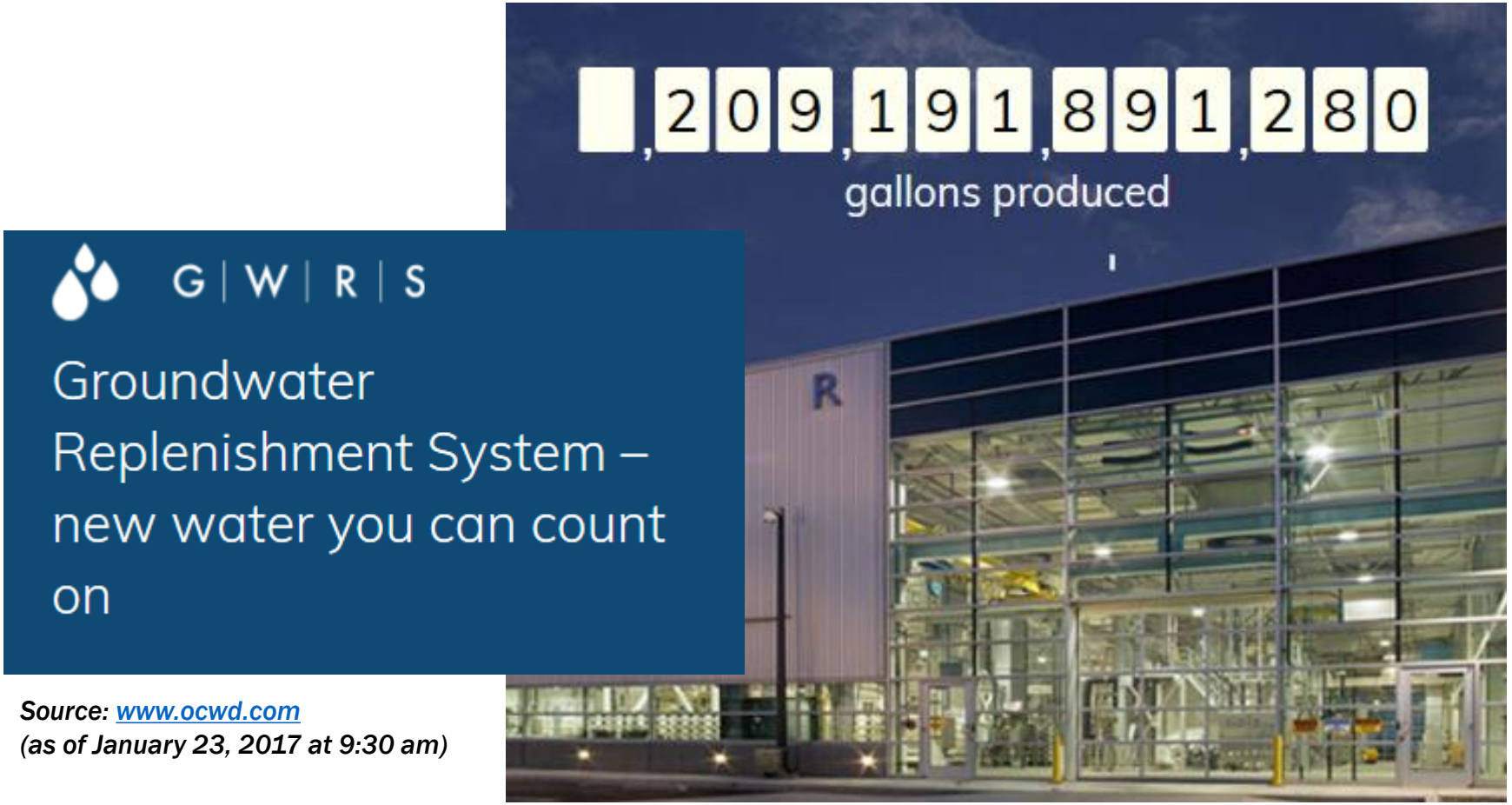
San Francisco is identifying opportunities for onsite reuse of water in buildings

- Up to 50% water savings can be achieved in residential buildings by replacing potable water with treated onsite water for toilet flushing, irrigation, and clothes washers.
- Using non-potable water for toilets, cooling towers, and irrigation can save up to 95% of potable water demands in an office.



Source: Kehoe, 2014; MPCA, 2014; Ellis et al., 2009; Hatt et al., 2006

OCWD - Tracking and Reporting on Key Metrics Can Provide Critical Feedback and Highlight Success



Source: www.ocwd.com
(as of January 23, 2017 at 9:30 am)

Questions and Discussion

Download a copy of the Blueprint for One Water:

http://www.waterrf.org/Pages/Projects.aspx?PID=4660

Adapting to Change: Utility Systems and Declining Flows

Who is CUWA?

Population Served - Over **26 million**

Retail Agencies:

- Alameda County Water District (ACWD)
- East Bay Municipal Utility District (EBMUD)
- Los Angeles Department of Water and Power (LADWP)

Retail/Wholesale Agencies:

- Contra Costa Water District (CCWD)
- City of San Diego (San Diego)
- San Francisco Public Utilities Commission (SFPUC)

Wholesale Agencies:

- Metropolitan Water District of Southern California (MWDSC)
- Santa Clara Valley Water District (SCVWD)
- San Diego County Water Authority (SDCWA)
- Zone 7 Water Agency (Zone 7)

CUWA's Mission

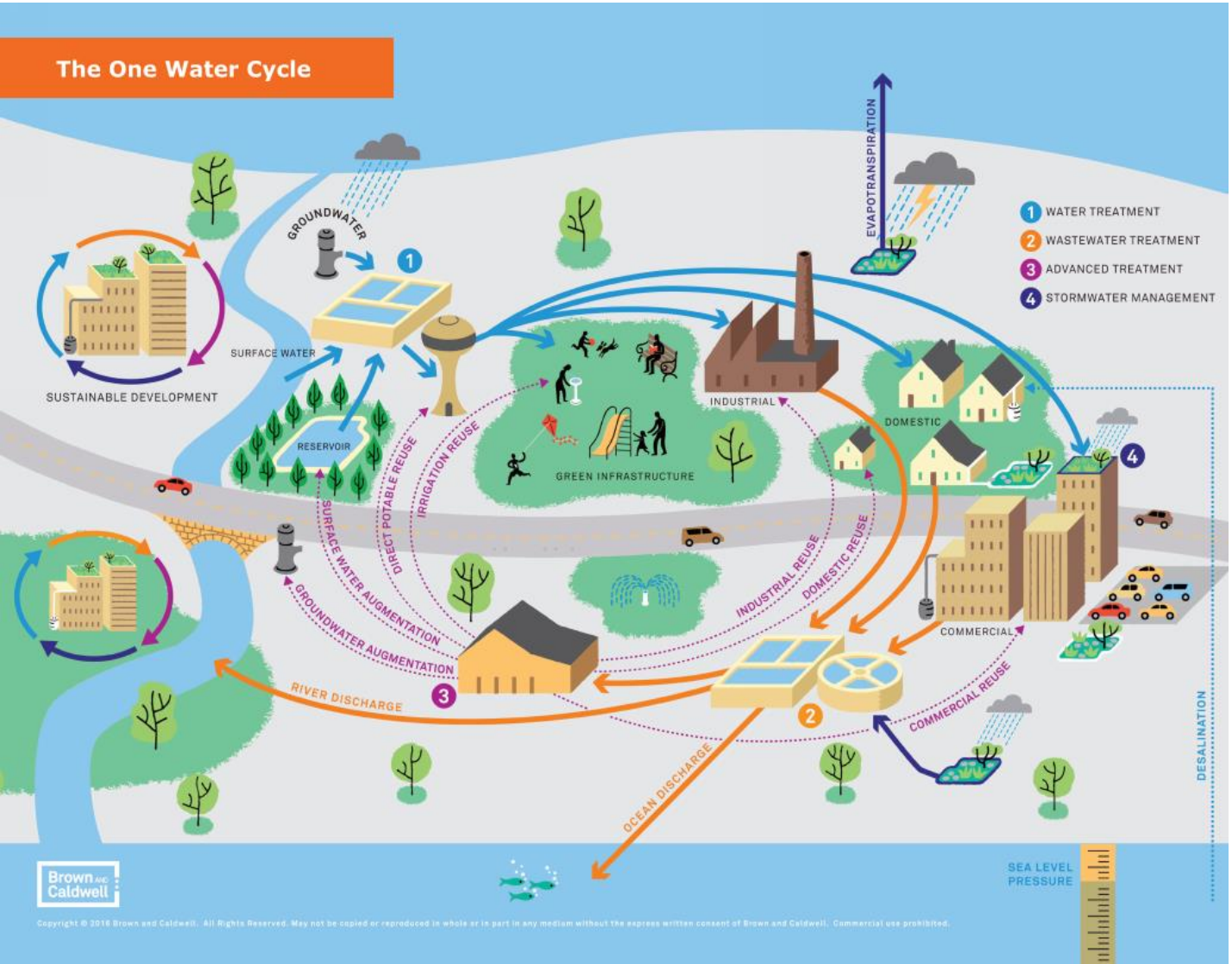
EBMUD Mokelumne Aqueduct

"To provide a forum for combining the expertise and resources of its member agencies to advance reliable high-quality water supplies for the State's current and future urban water needs in a cost-effective manner for the public, the environment and the economy."

Our objective is to leverage utility experiences to inform water use efficiency (WUE) policy

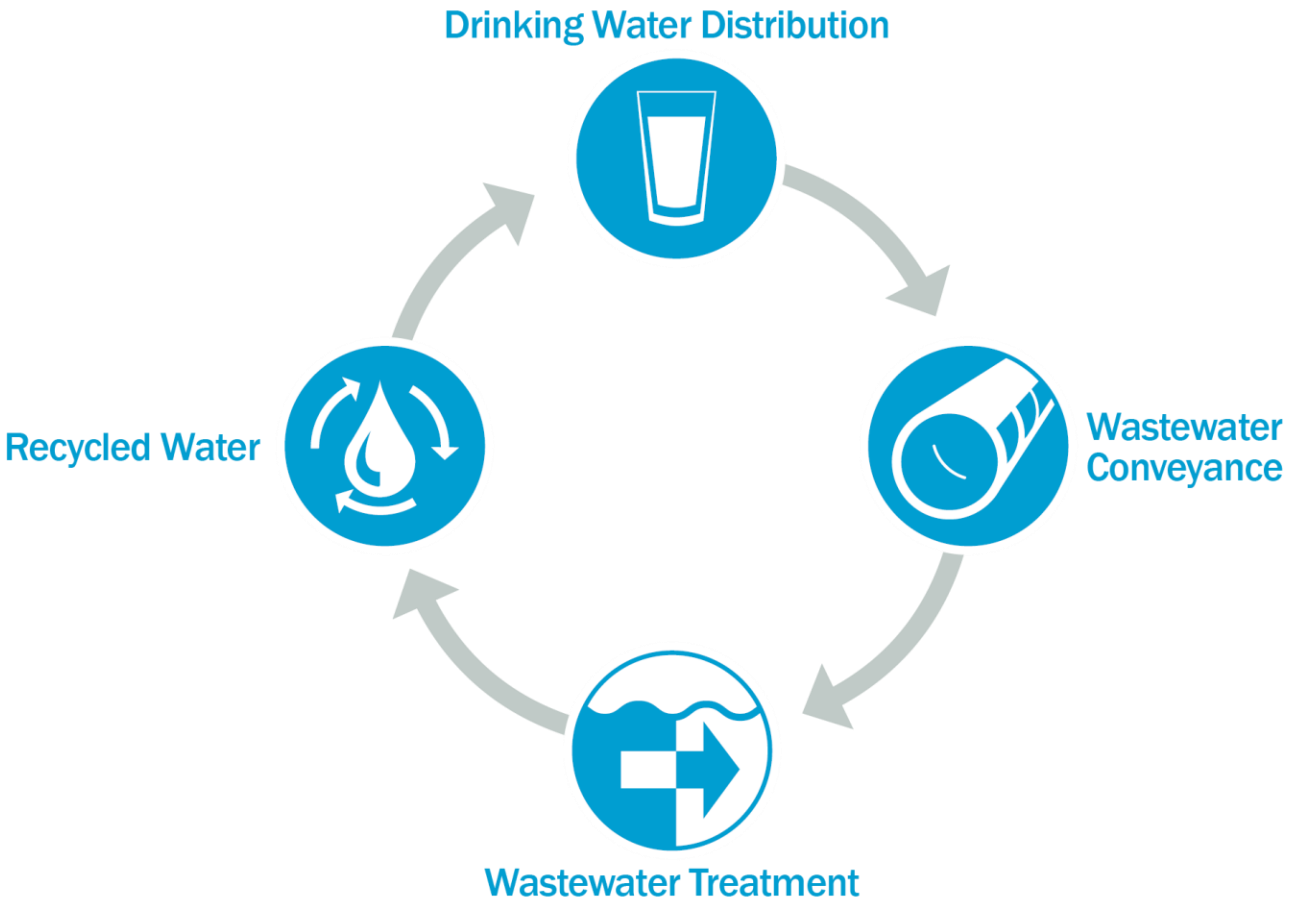
- Californians successfully responded to the call to reduce water use during the recent drought.
- Significant reduction in water demands revealed some impacts from declining flows.
- Observations **offer a preview** into the potential impact of establishing permanent indoor water use targets at or below the thresholds achieved during the emergency conservation mandate.

CUWA supports a holistic approach to addressing California's water supply challenges



Understanding how WUE strategies affect the interconnected water supply system is critical to optimizing future water management.

Research reveals declining flows have impacts on the interconnected urban water cycle



CUWA is working with collaborative partners to better understand these impacts

California Urban Water Agencies

Wise water use is encouraged through short term conservation and long term WUE

Conservation

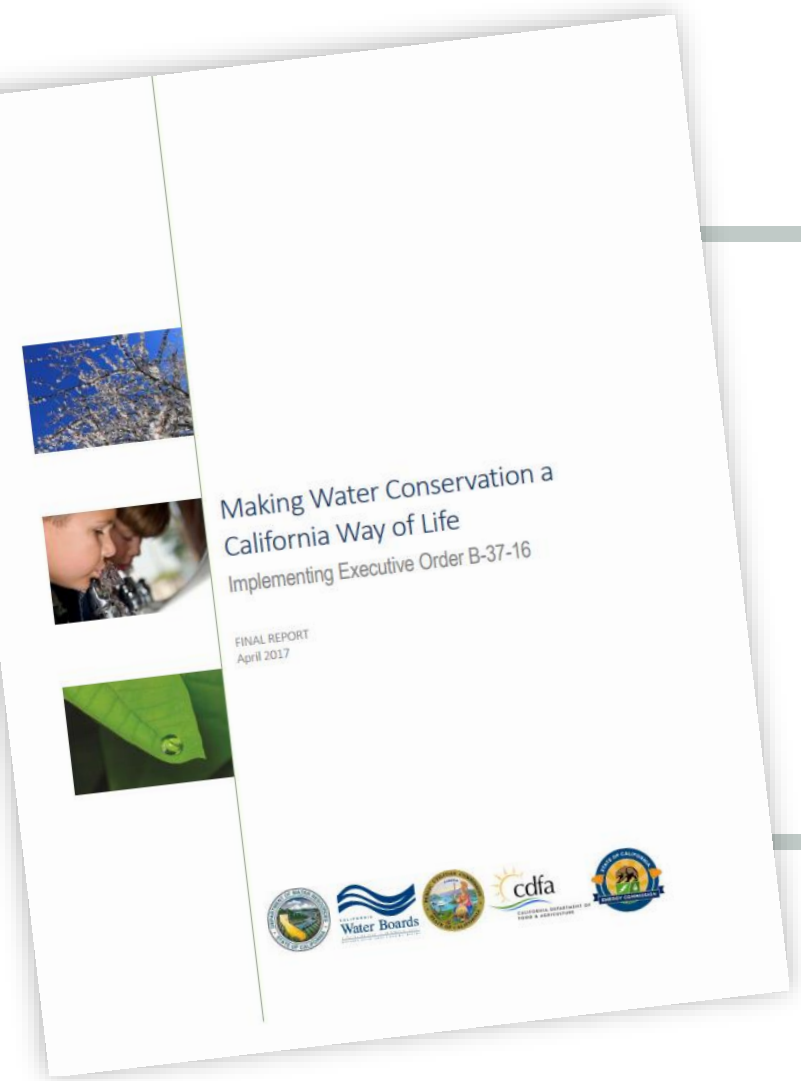
Short-term, emergency response for demand reductions during a drought

Water Use Efficiency

Long-term strategy for more sustained demand management

Source: Department of Water Resources

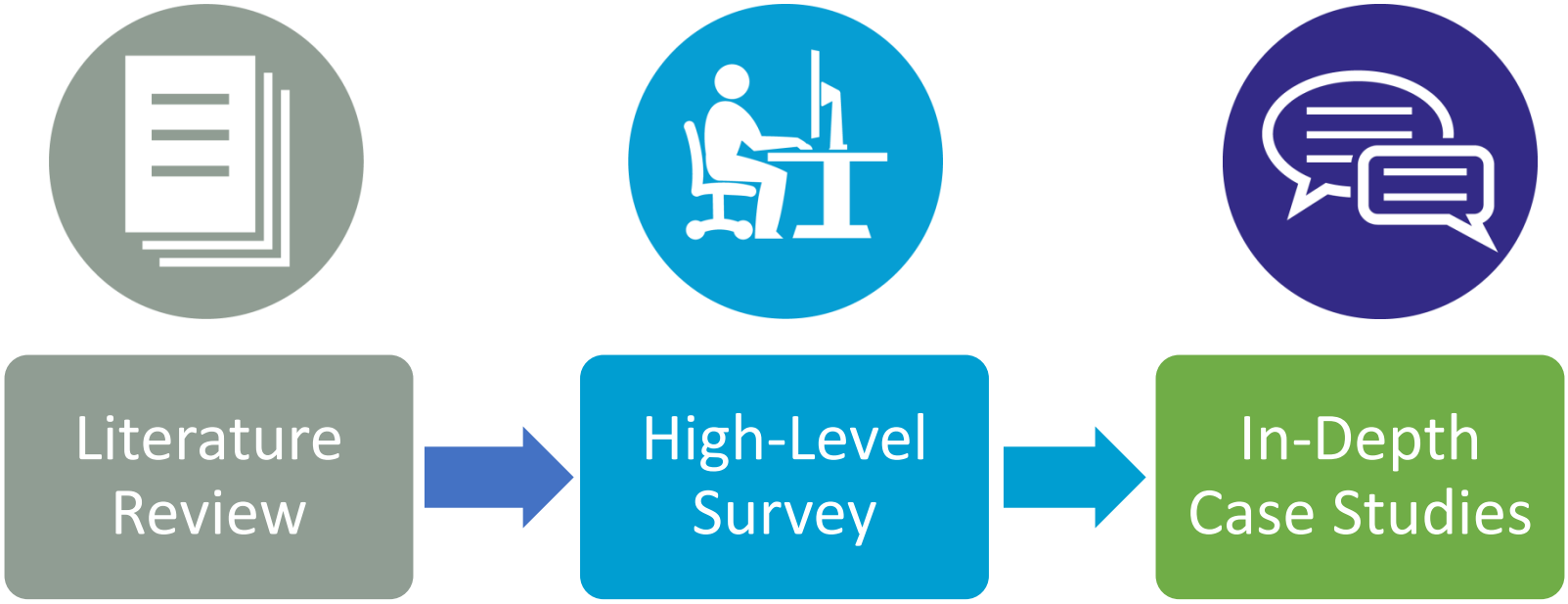
Our focus is on indoor water use since it has the greatest impact on the urban water cycle



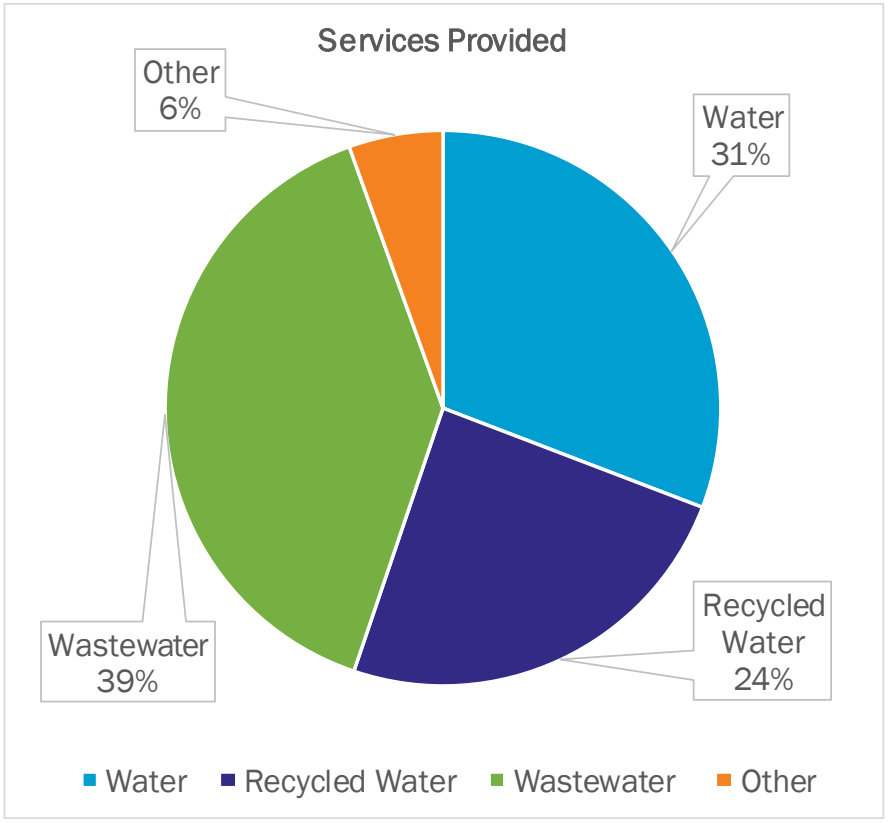
Supplier water use target is an aggregate of indoor water use, outdoor water use, and water loss.

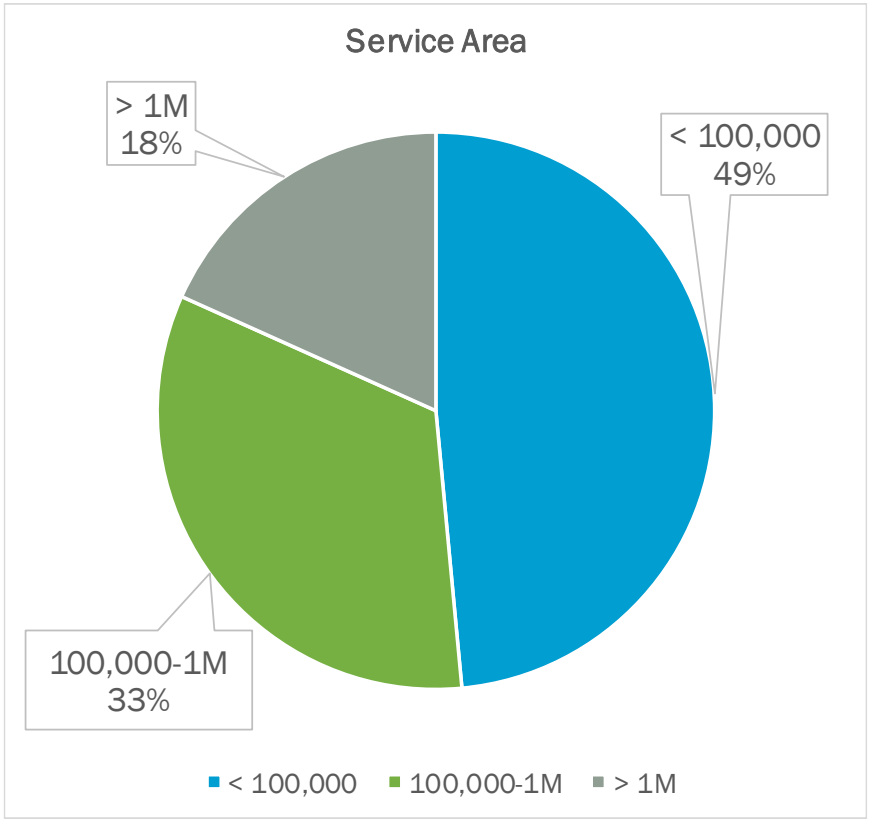
This project focuses on indoor water use because it has the greatest impact on the urban water cycle.

CUWA leveraged both literature and a survey of California utilities to develop the white paper

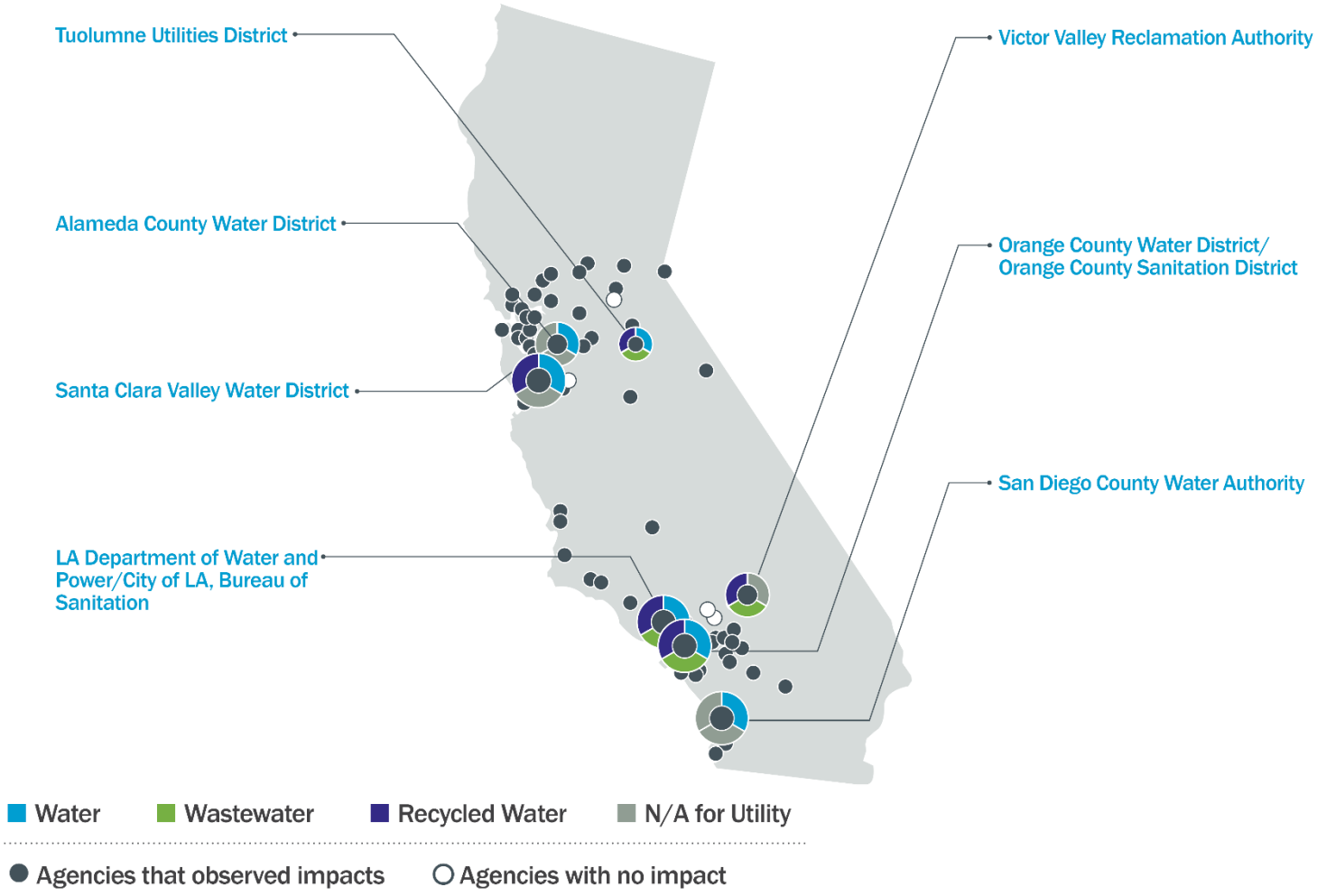


The high-level survey provided nearly 300 representative viewpoints

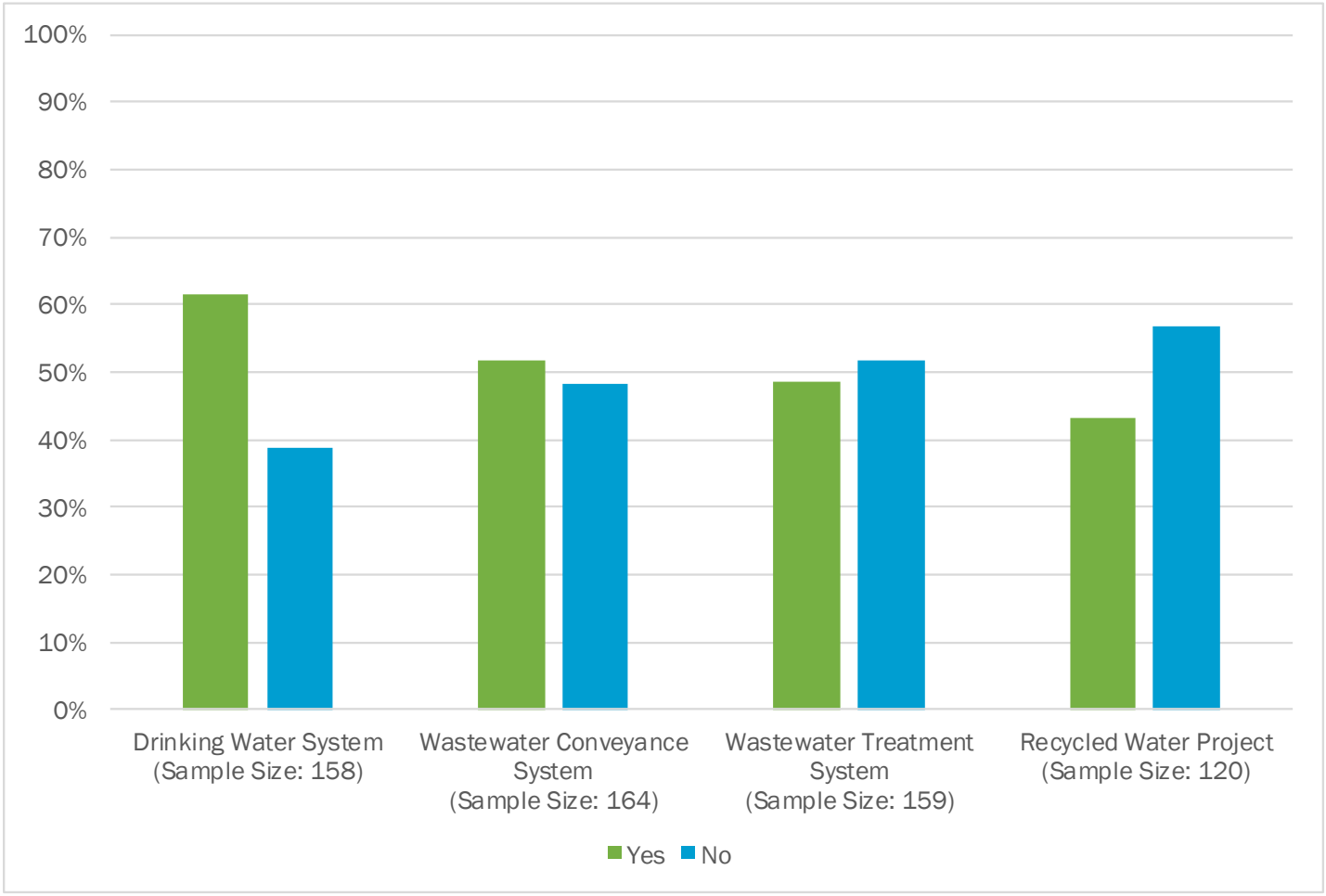




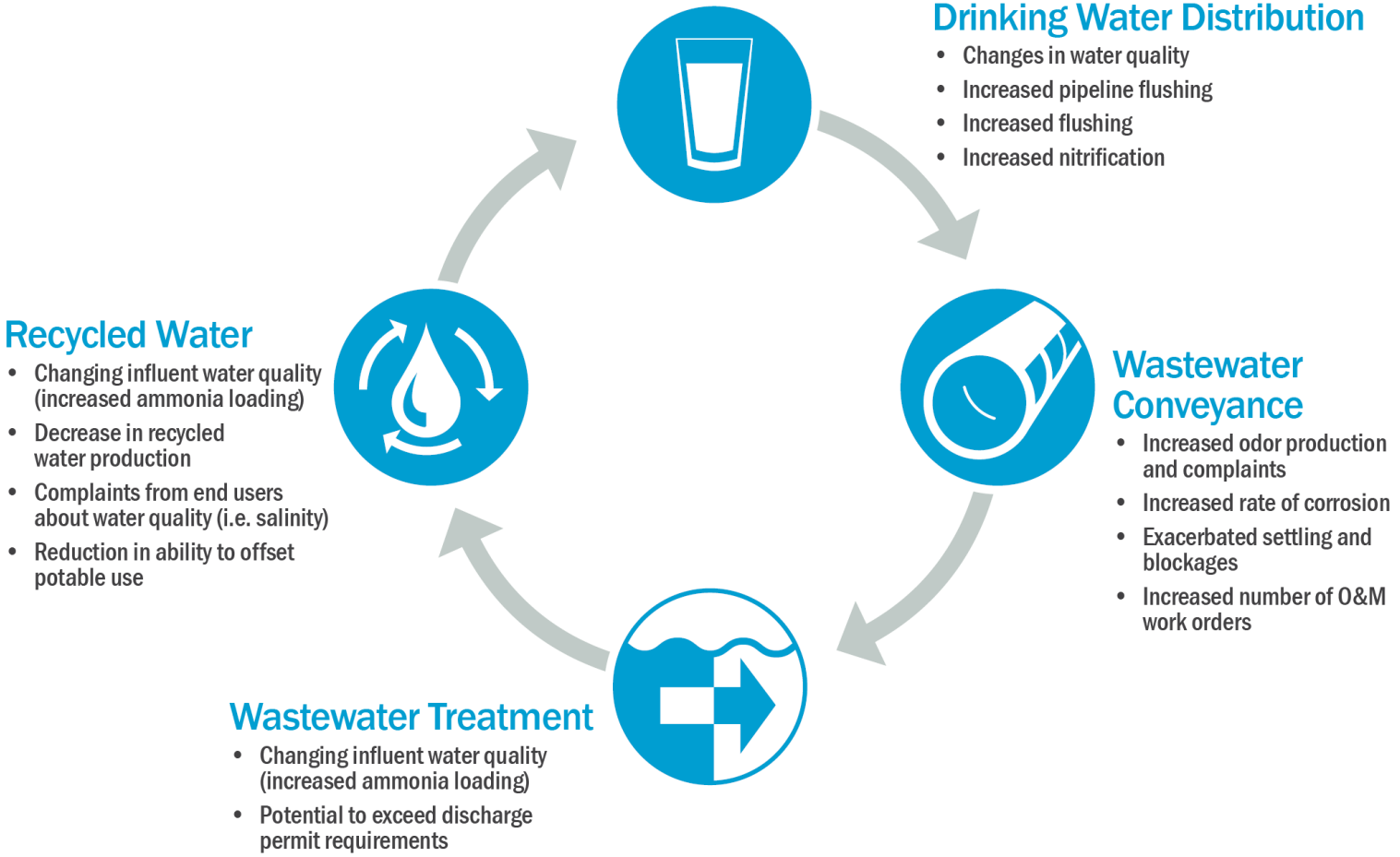
Many utilities are feeling the impacts and working to adapt



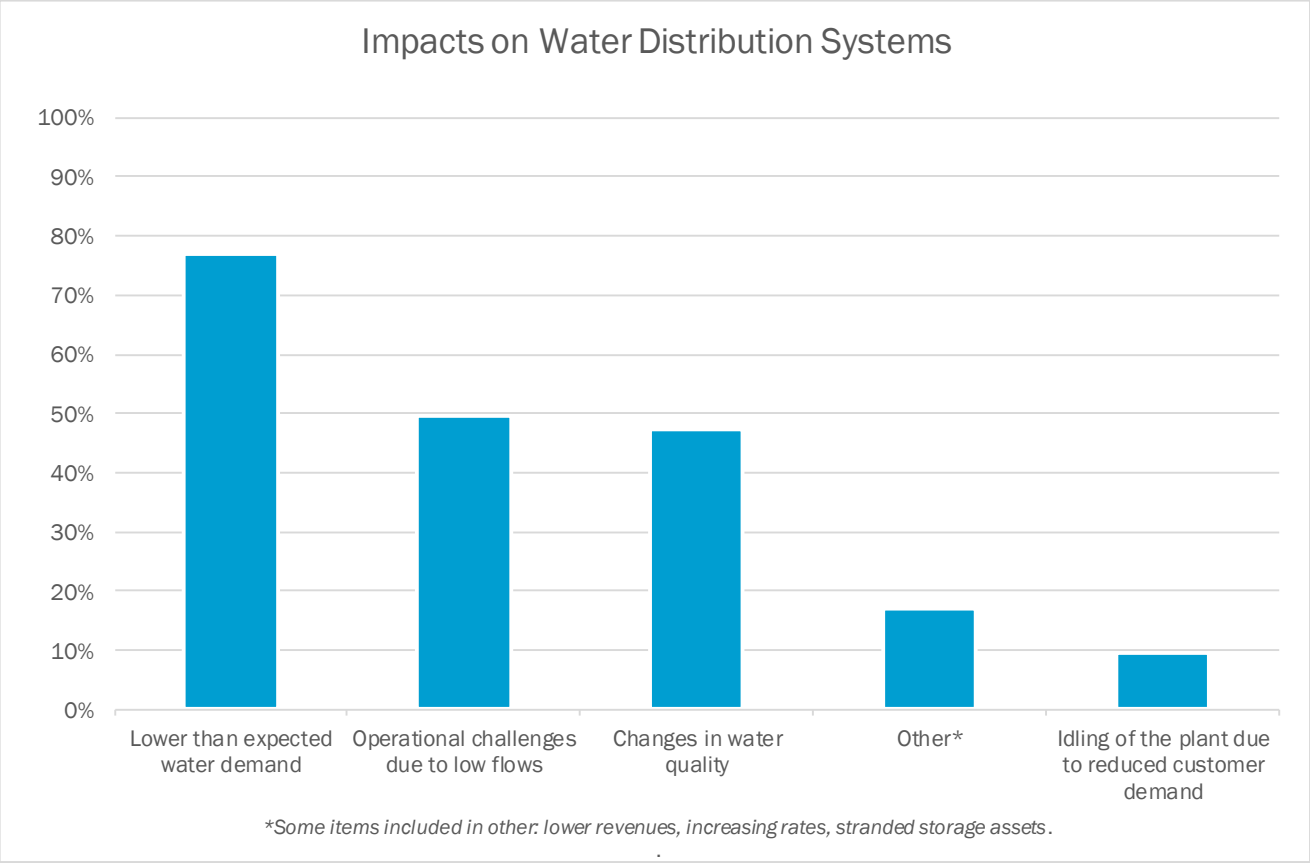
Nearly half of survey respondents have experienced impacts of declining flows



Impacts from declining flows experienced in all elements of the urban water cycle



Lower than expected water demand has led to impacts on water distribution systems



Of the impacted water system respondents, 49% reported operational challenges in water distribution systems due to low flows.

SDCWA has increased flushing of their aqueducts to adapt to declining flows

San Diego County Water Authority

Background:

- 24-member retail agencies
- 3.3 million people
- 150 square miles

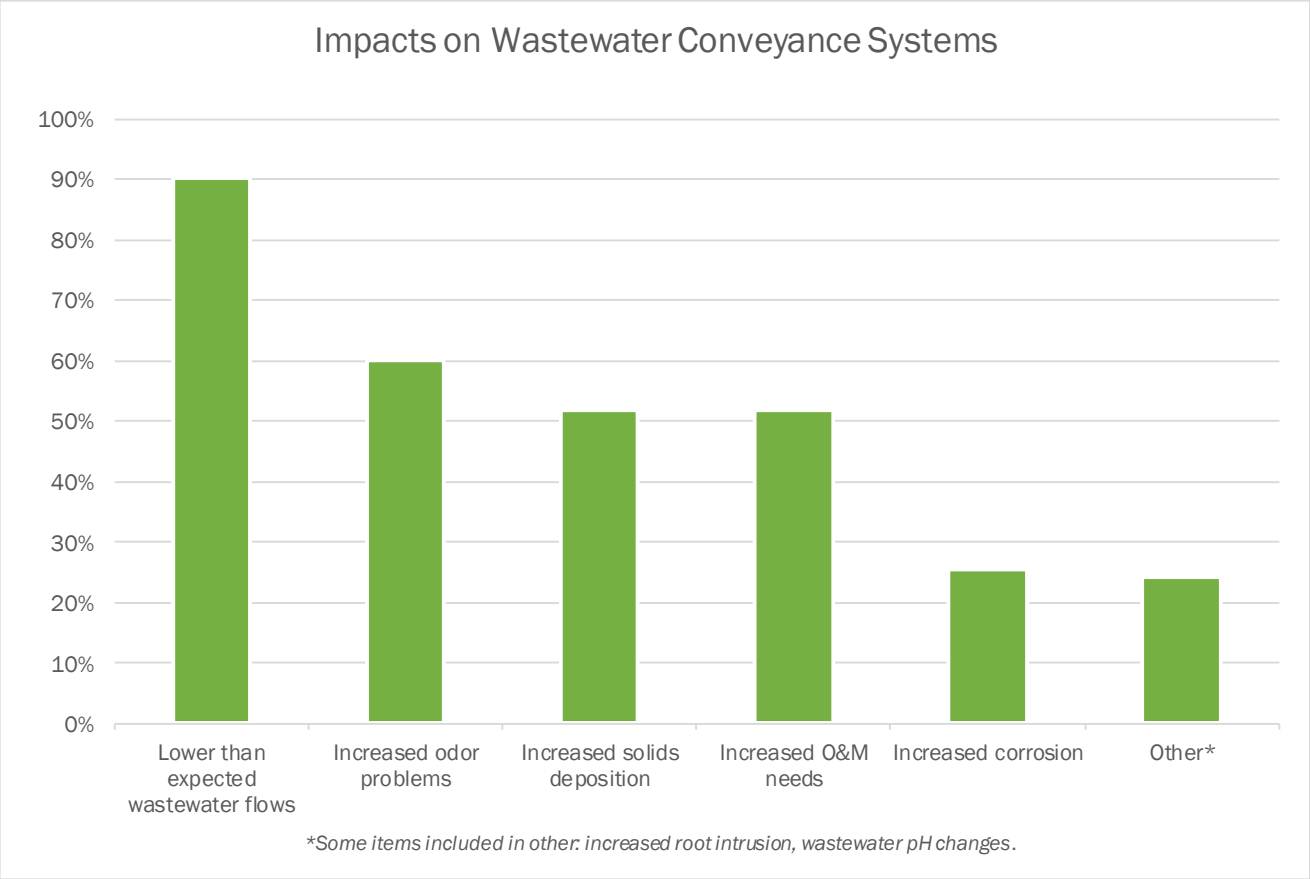
Impacts Experienced:

- Reduced conveyance system chlorine residuals
- Conveyance system nitrification

Adaptation Strategies & Financial Impacts:

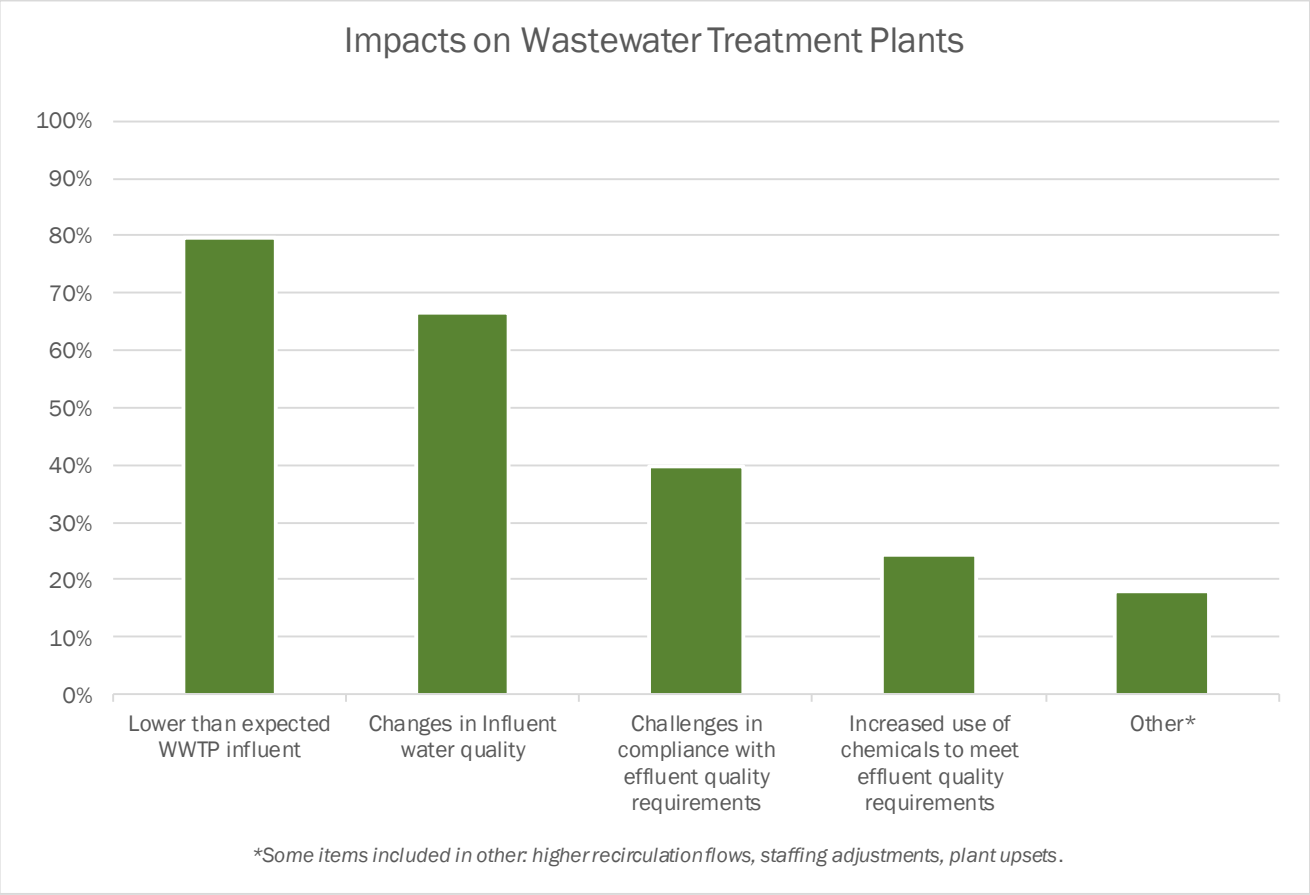
- Increased flushing: costs of flushing increased from $200,000/year to over $2 million/year.
- Investment in online monitoring equipment: $250,000 in new equipment.

Lower than expected wastewater flows has led to impacts on wastewater conveyance systems



Of the impacted wastewater conveyance respondents, 50% indicated increased solids deposition, odor problems, and O&M challenges.

Lower than expected WWTP influent flow has led to impacts on wastewater treatment processes



Of the impacted wastewater treatment respondents, 68% indicated changes in wastewater influent quality.

TUD invested in proactive pipe patching to mitigate increased root intrusion

Tuolumne Utilities District

Background:

- 44,000 residents
- 1.2 mgd of wastewater

Impacts Experienced:

- Increased sanitary sewer overflows and blockages
- Increased root intrusion

Adaptation Strategies & Financial Impacts:

- Increased maintenance of the collection system
- Invested in proactive pipe matching to counter increased root intrusion

Victor Valley invested in epoxy coating for their manholes to mitigate accelerated corrosion

Victor Valley Water Reclamation Authority (Wastewater Conveyance)

Background:

- 4 member agencies
- 42 miles of public sewers
- 10.7 mgd of wastewater

Impacts Experienced

- Increased odors and odor complaints
- Accelerated rate of corrosion and degradation of infrastructure

Adaptation Strategies & Financial Impacts:

- Operational improvements and increased rehabilitation and maintenance of manholes
  - Invested in $300,000 per year of epoxy coating over the past 5 years

Victor Valley adjusted treatment operations to address increased ammonia concentrations

Victor Valley Water Reclamation Authority (Wastewater Treatment)

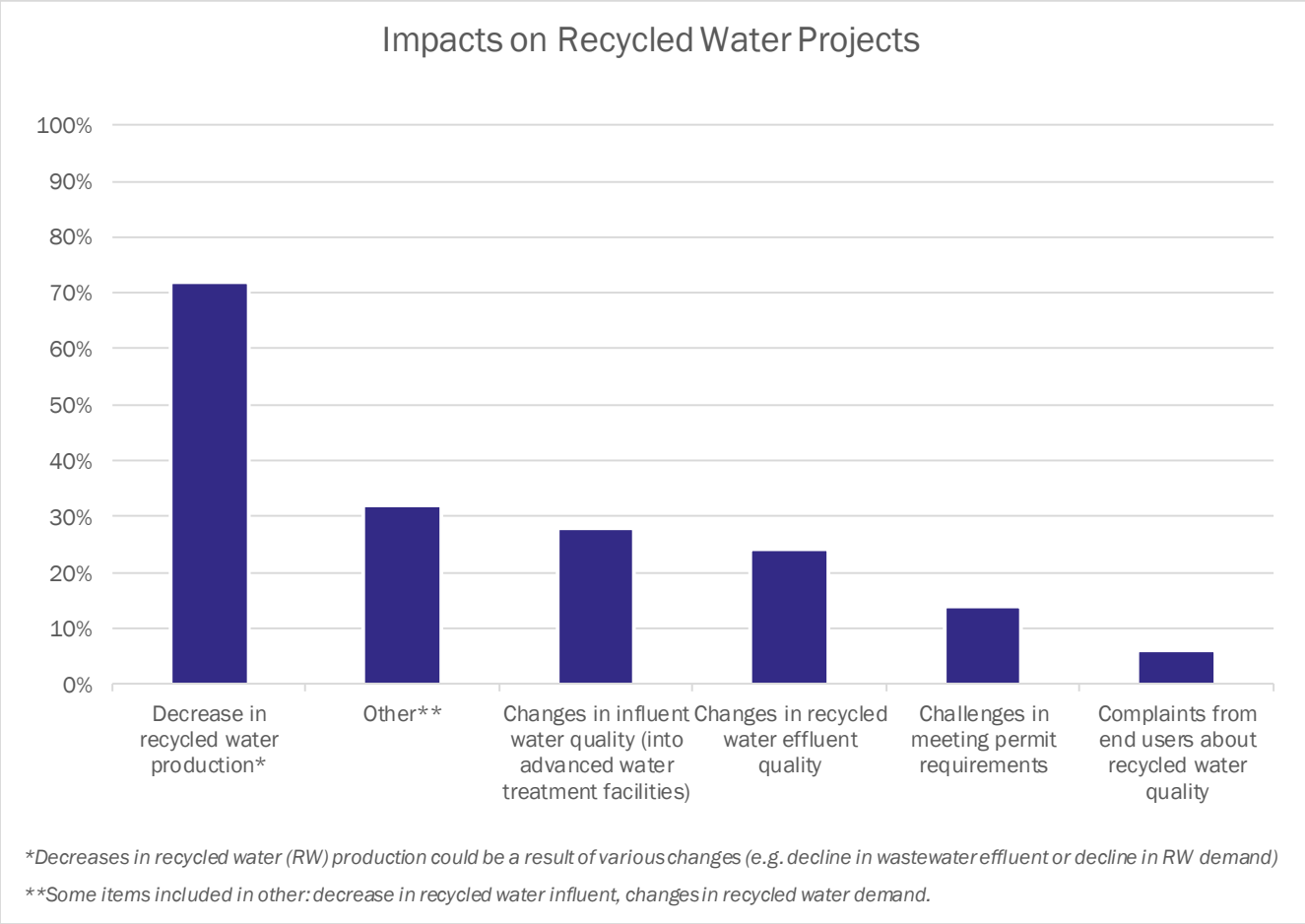
Impacts Experienced:

- Increased ammonia concentrations in wastewater influent
- Declining wastewater influent reduces recycled water volumes

Adaptation Strategies & Financial Impacts:

- Changed operations of the aeration basins to achieve the appropriate nitrification and denitrification
- Less recycled water available for reuse increases reliance on potable resources (groundwater)

Impacts on recycled water systems include changes in production and water quality



*Decreases in recycled water (RW) production could be a result of various changes (e.g. decline in wastewater effluent or decline in RW demand)

**Some items included in other: decrease in recycled water influent, changes in recycled water demand.

Of the impacted recycled water respondents, 70% indicated a decrease in recycled water production.

OCSD & OCWD have invested $60M to segregate high-salinity influent flows

Orange County Sanitation District & Orange County Water District

Background:

- 2.6 million people
- 2 wastewater treatment plants
- 100 mgd of highly purified water

Impacts Experienced:

- Reduced flows at the WWTPs
- Increasing salinity from discharge effluent from upstream utilities

Adaptation Strategies & Financial Impacts:

- Supplementing GWRS feed water flows with Plant 2 effluent
- Investing $60 million to segregate high-salinity flows

Insufficient wastewater flow could limit San Diego's ability to meet Pure Water goals

City of San Diego

Background:

- 1.3 million water customers
- 2.4 million wastewater customers
- 3 wastewater treatment plants
- multi-phased recycled water program to ultimately provide 83 mgd of pure water

Potential Impacts:

- Insufficient influent flow into the wastewater treatment plant
  - limit the City's ability to meet Pure Water supply diversification goals and commitments
  - reduce regional drought resilience capabilities

The white paper and policy principles is available for download at the CUWA website (www.cuwa.org).